



Full wwPDB EM Validation Report ⓘ

Mar 9, 2026 – 06:09 AM UTC

PDB ID : 8BF5 / pdb_00008bf5
EMDB ID : EMD-16013
Title : Early transcription elongation state of influenza A/H7N9 polymerase stalled with incoming GTP analogue
Authors : Cusack, S.; Kouba, T.
Deposited on : 2022-10-24
Resolution : 2.96 Å(reported)

This is a Full wwPDB EM Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

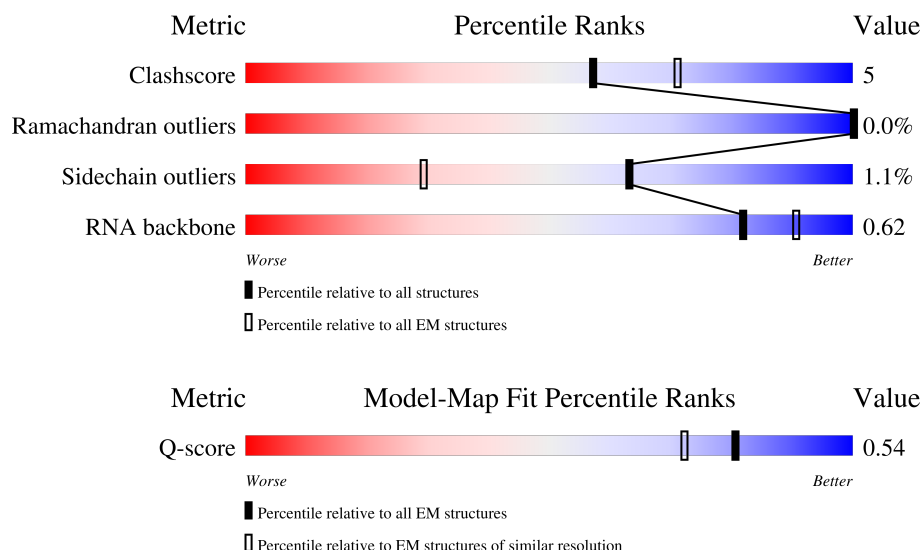
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data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

1 Overall quality at a glance

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 2.96 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
RNA backbone	8273	3508	-
Q-score	-	25397	13155 (2.46 - 3.46)

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	751	
2	B	772	
3	C	798	

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Mol	Chain	Length	Quality of chain
4	V	14	 43% 29% 14% 14%
5	R	21	 33% 24% 43%
6	M	19	 5% 53% 11% 5% 32%

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 35707 atoms, of which 17699 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 Polymerase acidic protein.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	A	697	Total	C	H	N	O	S	0	0
			11187	3561	5591	939	1057	39		

There are 25 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-13	GLY	-	expression tag	UNP Q5V8Z9
A	-12	SER	-	expression tag	UNP Q5V8Z9
A	-11	HIS	-	expression tag	UNP Q5V8Z9
A	-10	HIS	-	expression tag	UNP Q5V8Z9
A	-9	HIS	-	expression tag	UNP Q5V8Z9
A	-8	HIS	-	expression tag	UNP Q5V8Z9
A	-7	HIS	-	expression tag	UNP Q5V8Z9
A	-6	HIS	-	expression tag	UNP Q5V8Z9
A	-5	HIS	-	expression tag	UNP Q5V8Z9
A	-4	HIS	-	expression tag	UNP Q5V8Z9
A	-3	GLY	-	expression tag	UNP Q5V8Z9
A	-2	SER	-	expression tag	UNP Q5V8Z9
A	-1	GLY	-	expression tag	UNP Q5V8Z9
A	0	SER	-	expression tag	UNP Q5V8Z9
A	727	GLY	-	expression tag	UNP Q5V8Z9
A	728	SER	-	expression tag	UNP Q5V8Z9
A	729	GLY	-	expression tag	UNP Q5V8Z9
A	730	SER	-	expression tag	UNP Q5V8Z9
A	731	GLY	-	expression tag	UNP Q5V8Z9
A	732	GLU	-	expression tag	UNP Q5V8Z9
A	733	ASN	-	expression tag	UNP Q5V8Z9
A	734	LEU	-	expression tag	UNP Q5V8Z9
A	735	TYR	-	expression tag	UNP Q5V8Z9
A	736	PHE	-	expression tag	UNP Q5V8Z9
A	737	GLN	-	expression tag	UNP Q5V8Z9

- Molecule 2 is a protein called RNA-directed RNA polymerase catalytic subunit.

Mol	Chain	Residues	Atoms						AltConf	Trace
2	B	726	Total	C	H	N	O	S	0	0
			11418	3600	5714	986	1066	52		

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-8	GLY	-	expression tag	UNP Q5V8Y6
B	-7	SER	-	expression tag	UNP Q5V8Y6
B	-6	GLY	-	expression tag	UNP Q5V8Y6
B	-5	SER	-	expression tag	UNP Q5V8Y6
B	-4	GLY	-	expression tag	UNP Q5V8Y6
B	-3	SER	-	expression tag	UNP Q5V8Y6
B	-2	GLY	-	expression tag	UNP Q5V8Y6
B	-1	SER	-	expression tag	UNP Q5V8Y6
B	0	GLY	-	expression tag	UNP Q5V8Y6
B	753	GLY	-	expression tag	UNP Q5V8Y6
B	754	SER	-	expression tag	UNP Q5V8Y6
B	755	GLY	-	expression tag	UNP Q5V8Y6
B	756	SER	-	expression tag	UNP Q5V8Y6
B	757	GLY	-	expression tag	UNP Q5V8Y6
B	758	GLU	-	expression tag	UNP Q5V8Y6
B	759	ASN	-	expression tag	UNP Q5V8Y6
B	760	LEU	-	expression tag	UNP Q5V8Y6
B	761	TYR	-	expression tag	UNP Q5V8Y6
B	762	PHE	-	expression tag	UNP Q5V8Y6
B	763	GLN	-	expression tag	UNP Q5V8Y6

- Molecule 3 is a protein called Polymerase basic protein 2.

Mol	Chain	Residues	Atoms						AltConf	Trace
3	C	729	Total	C	H	N	O	S	0	0
			11827	3707	5995	1021	1064	40		

There are 28 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-8	GLY	-	expression tag	UNP Q5V8X3
C	-7	SER	-	expression tag	UNP Q5V8X3
C	-6	GLY	-	expression tag	UNP Q5V8X3
C	-5	SER	-	expression tag	UNP Q5V8X3
C	-4	GLY	-	expression tag	UNP Q5V8X3
C	-3	SER	-	expression tag	UNP Q5V8X3
C	-2	GLY	-	expression tag	UNP Q5V8X3

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-1	SER	-	expression tag	UNP Q5V8X3
C	0	GLY	-	expression tag	UNP Q5V8X3
C	771	GLY	-	expression tag	UNP Q5V8X3
C	772	TRP	-	expression tag	UNP Q5V8X3
C	773	SER	-	expression tag	UNP Q5V8X3
C	774	HIS	-	expression tag	UNP Q5V8X3
C	775	PRO	-	expression tag	UNP Q5V8X3
C	776	GLN	-	expression tag	UNP Q5V8X3
C	777	PHE	-	expression tag	UNP Q5V8X3
C	778	GLU	-	expression tag	UNP Q5V8X3
C	779	LYS	-	expression tag	UNP Q5V8X3
C	780	GLY	-	expression tag	UNP Q5V8X3
C	781	SER	-	expression tag	UNP Q5V8X3
C	782	GLY	-	expression tag	UNP Q5V8X3
C	783	SER	-	expression tag	UNP Q5V8X3
C	784	GLU	-	expression tag	UNP Q5V8X3
C	785	ASN	-	expression tag	UNP Q5V8X3
C	786	LEU	-	expression tag	UNP Q5V8X3
C	787	TYR	-	expression tag	UNP Q5V8X3
C	788	PHE	-	expression tag	UNP Q5V8X3
C	789	GLN	-	expression tag	UNP Q5V8X3

- Molecule 4 is a RNA chain called 5' vRNA.

Mol	Chain	Residues	Atoms						AltConf	Trace
4	V	12	Total	C	H	N	O	P	0	0
			392	117	130	52	81	12		

- Molecule 5 is a RNA chain called 3' vRNA.

Mol	Chain	Residues	Atoms						AltConf	Trace
5	R	12	Total	C	H	N	O	P	0	0
			392	117	131	53	79	12		

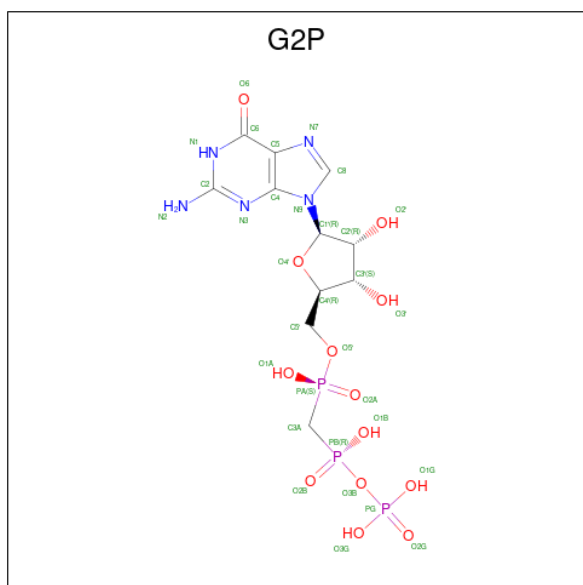
- Molecule 6 is a RNA chain called mRNA.

Mol	Chain	Residues	Atoms						AltConf	Trace
6	M	13	Total	C	H	N	O	P	0	0
			405	120	138	39	95	13		

- Molecule 7 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

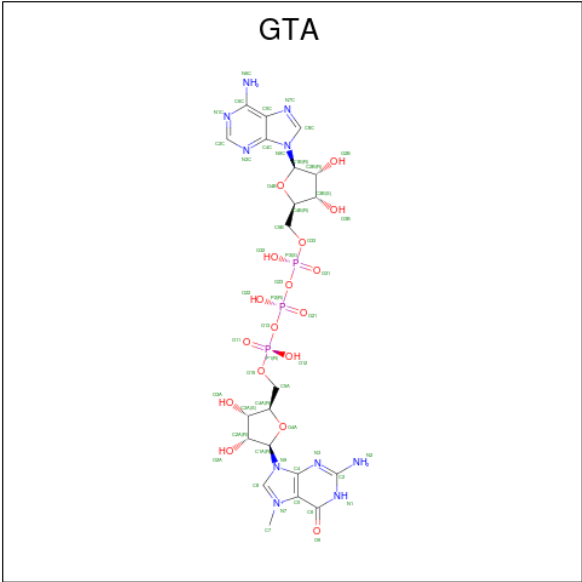
Mol	Chain	Residues	Atoms		AltConf
7	A	1	Total	Mg	0
			1	1	
7	B	2	Total	Mg	0
			2	2	

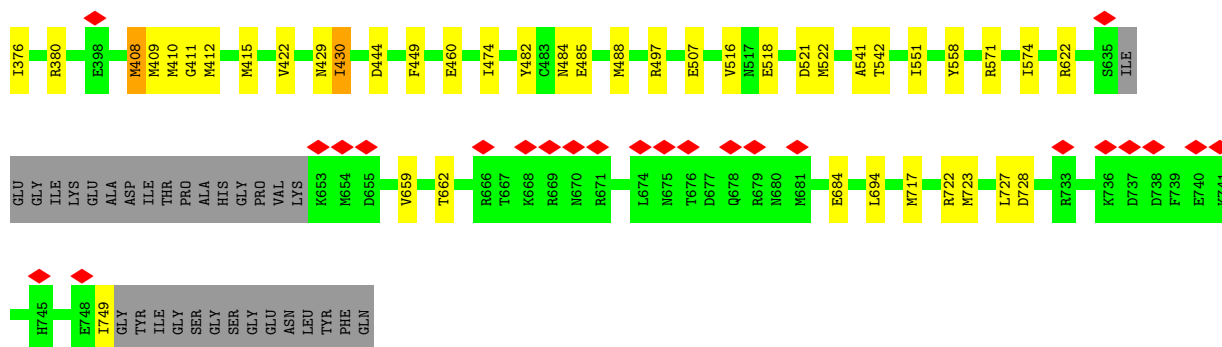
- Molecule 8 is PHOSPHOMETHYLPHOSPHONIC ACID GUANYLATE ESTER (CCD ID: G2P) (formula: $C_{11}H_{18}N_5O_{13}P_3$) (labeled as "Ligand of Interest" by depositor).



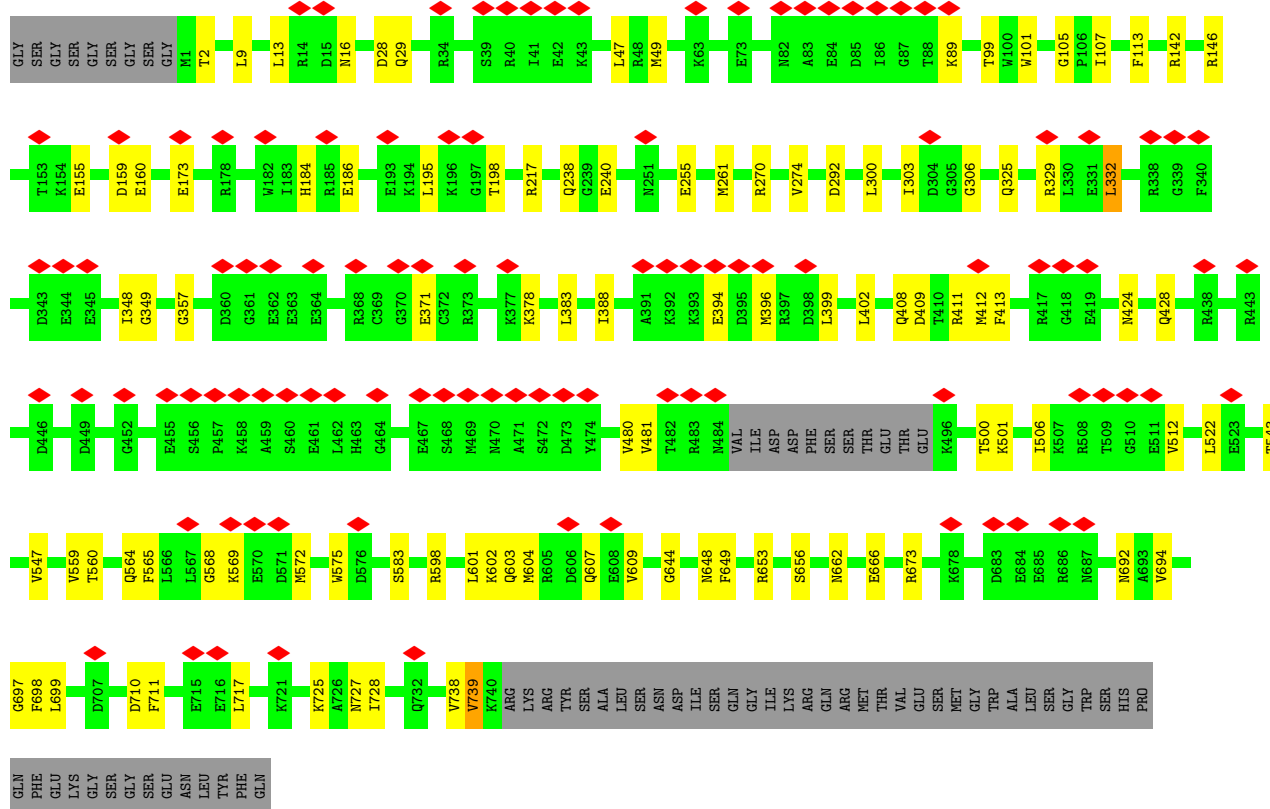
Mol	Chain	Residues	Atoms					AltConf
8	B	1	Total	C	N	O	P	0
			32	11	5	13	3	

- Molecule 9 is P1-7-METHYLGUANOSINE-P3-ADENOSINE-5',5'-TRIPHOSPHATE (CCD ID: GTA) (formula: $C_{21}H_{30}N_{10}O_{17}P_3$).

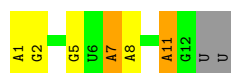




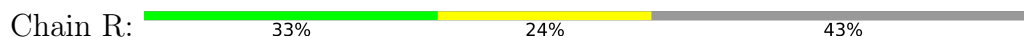
• Molecule 3: Polymerase basic protein 2



• Molecule 4: 5' vRNA



• Molecule 5: 3' vRNA





● Molecule 6: mRNA



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	55634	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING ONLY	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	40	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor
Maximum map value	0.830	Depositor
Minimum map value	-0.219	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.017	Depositor
Recommended contour level	0.22	Depositor
Map size ($\text{\AA}$)	354.98203, 354.98203, 354.98203	wwPDB
Map dimensions	460, 460, 460	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	0.7717001, 0.7717001, 0.7717001	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: G2P, MG, GTA

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	0.10	0/5710	0.23	0/7701
2	B	0.11	0/5814	0.24	0/7835
3	C	0.09	0/5932	0.22	0/7973
4	V	0.10	0/294	0.29	0/455
5	R	0.11	0/293	0.21	0/455
6	M	0.08	0/294	0.19	0/451
All	All	0.10	0/18337	0.23	0/24870

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	5596	5591	5593	49	0
2	B	5704	5714	5714	71	0
3	C	5832	5995	5995	65	0
4	V	262	130	131	6	0
5	R	261	131	132	3	0
6	M	267	138	139	3	0
7	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	B	2	0	0	0	0
8	B	32	0	14	0	0
9	M	51	0	26	6	0
All	All	18008	17699	17744	168	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 5.

All (168) 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:V:5:G:N2	4:V:5:G:OP2	2.05	0.89
2:B:521:ASP:OD2	2:B:558:TYR:OH	1.91	0.87
3:C:306:GLY:O	9:M:101:GTA:N6C	2.10	0.85
2:B:151:ARG:NH2	3:C:29:GLN:OE1	2.17	0.78
1:A:16:LYS:NZ	1:A:46:TYR:OH	2.20	0.74
3:C:644:GLY:O	3:C:648:ASN:ND2	2.21	0.72
1:A:472:SER:O	1:A:502:LYS:NZ	2.23	0.72
1:A:303:LYS:NZ	1:A:346:THR:O	2.22	0.70
3:C:424:ASN:OD1	3:C:428:GLN:N	2.25	0.70
1:A:445:GLU:OE1	1:A:634:ARG:NH1	2.26	0.69
3:C:728:ILE:HD13	3:C:738:VAL:HG22	1.74	0.68
2:B:444:ASP:OD1	6:M:20:A:O3'	2.08	0.67
3:C:564:GLN:O	3:C:568:GLY:N	2.27	0.67
2:B:157:GLY:N	2:B:169:ASP:OD2	2.27	0.67
3:C:270:ARG:NH2	3:C:522:LEU:O	2.28	0.67
1:A:4:PHE:O	1:A:8:ASN:ND2	2.27	0.66
1:A:149:SER:OG	1:A:153:ASP:O	2.13	0.65
4:V:7:A:O2'	4:V:8:A:OP2	2.09	0.65
3:C:569:LYS:O	3:C:602:LYS:NZ	2.29	0.65
1:A:33:ALA:O	1:A:37:ASN:ND2	2.30	0.64
3:C:649:PHE:O	3:C:656:SER:OG	2.14	0.64
2:B:98:GLU:OE1	2:B:99:HIS:NE2	2.31	0.64
2:B:488:MET:SD	2:B:497:ARG:NH1	2.71	0.64
1:A:238:ALA:N	2:B:90:GLU:OE1	2.31	0.64
3:C:717:LEU:HD21	3:C:728:ILE:HD11	1.79	0.63
1:A:91:VAL:HG22	2:B:723:MET:HG3	1.80	0.63
3:C:607:GLN:N	3:C:607:GLN:OE1	2.32	0.61
2:B:484:ASN:ND2	2:B:485:GLU:O	2.34	0.60
1:A:36:PHE:CZ	1:A:181:LEU:HD11	2.37	0.60
2:B:207:LYS:NZ	2:B:684:GLU:OE2	2.35	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:160:GLU:OE2	3:C:184:HIS:NE2	2.34	0.59
2:B:408:MET:O	2:B:411:GLY:N	2.35	0.58
2:B:518:GLU:OE2	2:B:571:ARG:NH1	2.37	0.58
1:A:343:CYS:SG	1:A:501:VAL:HG22	2.44	0.57
3:C:159:ASP:OD1	3:C:160:GLU:N	2.36	0.57
3:C:609:VAL:HG11	3:C:692:ASN:HB2	1.87	0.56
1:A:136:LYS:O	1:A:140:GLY:N	2.39	0.56
1:A:129:ASP:OD2	1:A:133:TRP:NE1	2.38	0.55
2:B:574:ILE:HG22	3:C:99:THR:HG22	1.88	0.55
1:A:333:GLU:OE1	1:A:333:GLU:N	2.36	0.55
1:A:242:ASN:ND2	2:B:87:CYS:SG	2.77	0.55
3:C:261:MET:SD	3:C:300:LEU:HD23	2.47	0.54
2:B:35:GLY:HA3	2:B:228:THR:HG23	1.89	0.54
2:B:340:ALA:HB3	2:B:341:PRO:HD3	1.90	0.53
3:C:325:GLN:OE1	9:M:101:GTA:H1A	2.07	0.53
3:C:710:ASP:OD1	3:C:711:PHE:N	2.40	0.52
3:C:565:PHE:HB2	3:C:572:MET:HE2	1.91	0.52
3:C:155:GLU:OE2	3:C:217:ARG:NH1	2.38	0.52
3:C:195:LEU:O	3:C:198:THR:HG22	2.10	0.52
9:M:101:GTA:H5A1	9:M:101:GTA:O21	2.10	0.52
2:B:268:GLN:CG	2:B:422:VAL:HG13	2.40	0.52
1:A:356:LEU:HD12	1:A:501:VAL:HG13	1.91	0.51
1:A:288:GLU:OE1	1:A:457:LYS:NZ	2.37	0.51
3:C:727:ASN:C	3:C:728:ILE:HD12	2.35	0.51
2:B:662:THR:HG21	3:C:101:TRP:CD1	2.45	0.51
2:B:69:THR:HG23	2:B:317:ILE:HD11	1.91	0.51
3:C:409:ASP:OD2	3:C:411:ARG:NE	2.44	0.51
3:C:412:MET:HE1	3:C:413:PHE:CE1	2.46	0.50
1:A:636:ILE:HD11	2:B:8:LEU:HD22	1.93	0.50
2:B:429:ASN:OD1	2:B:430:ILE:N	2.44	0.50
2:B:306:ASN:ND2	2:B:444:ASP:O	2.39	0.50
1:A:94:SER:HB3	2:B:727:LEU:HD11	1.92	0.50
2:B:574:ILE:H	2:B:574:ILE:HD12	1.75	0.50
1:A:664:LEU:HD21	2:B:482:TYR:HB2	1.94	0.50
1:A:584:MET:SD	1:A:636:ILE:HD12	2.52	0.50
3:C:146:ARG:NH2	6:M:4:C:N3	2.60	0.49
1:A:559:VAL:O	4:V:2:G:O2'	2.28	0.49
3:C:357:GLY:O	3:C:408:GLN:NE2	2.36	0.49
2:B:252:VAL:HG21	2:B:412:MET:HE3	1.94	0.49
2:B:507:GLU:N	2:B:507:GLU:OE1	2.45	0.49
1:A:381:ILE:HG23	2:B:376:ILE:HG22	1.95	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:543:THR:O	3:C:547:VAL:HG23	2.13	0.49
3:C:662:ASN:O	3:C:666:GLU:N	2.46	0.49
2:B:26:GLY:O	2:B:233:ARG:NH2	2.44	0.48
3:C:142:ARG:NE	3:C:240:GLU:OE2	2.41	0.48
1:A:508:ARG:NH1	4:V:11:A:N3	2.62	0.47
2:B:408:MET:HA	2:B:408:MET:HE2	1.97	0.47
1:A:95:LEU:HD13	1:A:111:PHE:CG	2.50	0.47
3:C:500:THR:HG22	3:C:501:LYS:N	2.29	0.47
9:M:101:GTA:H5A1	9:M:101:GTA:P2	2.55	0.47
2:B:408:MET:O	2:B:409:MET:C	2.58	0.46
2:B:266:LEU:HD13	2:B:422:VAL:HG11	1.96	0.46
3:C:107:ILE:HD12	3:C:107:ILE:N	2.30	0.46
3:C:332:LEU:N	3:C:332:LEU:HD12	2.31	0.46
1:A:262:LEU:HD11	1:A:668:LEU:HD12	1.98	0.45
3:C:500:THR:HG22	3:C:501:LYS:H	1.80	0.45
1:A:619:THR:HG23	2:B:7:PHE:CE2	2.52	0.45
1:A:180:GLU:OE1	1:A:180:GLU:N	2.49	0.45
1:A:370:LEU:HD13	4:V:1:A:N7	2.32	0.45
3:C:378:LYS:NZ	9:M:101:GTA:O6	2.49	0.45
3:C:506:ILE:HG22	3:C:512:VAL:HG22	1.98	0.45
1:A:263:ARG:NH2	1:A:687:GLU:OE2	2.45	0.45
3:C:399:LEU:O	3:C:399:LEU:HD13	2.16	0.45
1:A:274:LEU:O	1:A:398:ARG:NH1	2.43	0.45
2:B:34:THR:HG22	4:V:8:A:OP1	2.17	0.45
3:C:727:ASN:O	3:C:728:ILE:HD12	2.16	0.45
2:B:166:PHE:CE2	2:B:170:ILE:HD11	2.52	0.44
3:C:274:VAL:HG11	3:C:583:SER:HA	1.98	0.44
1:A:619:THR:HG23	2:B:7:PHE:HE2	1.82	0.44
3:C:653:ARG:HG2	3:C:694:VAL:HG13	2.00	0.44
2:B:694:LEU:HD23	2:B:717:MET:HE1	2.00	0.44
1:A:665:ILE:HG21	1:A:706:TRP:CH2	2.52	0.44
2:B:297:GLY:C	2:B:298:ILE:HD12	2.43	0.44
2:B:309:TRP:HZ3	2:B:474:ILE:HG23	1.82	0.44
3:C:725:LYS:CG	3:C:739:VAL:HG22	2.48	0.44
1:A:446:ILE:HG21	1:A:577:LEU:CD2	2.47	0.44
3:C:559:VAL:HG23	3:C:560:THR:N	2.32	0.44
3:C:728:ILE:HD13	3:C:738:VAL:CG2	2.44	0.43
1:A:109:ASP:OD2	1:A:121:VAL:N	2.44	0.43
2:B:255:VAL:HG21	2:B:340:ALA:HB3	1.98	0.43
2:B:268:GLN:HG3	2:B:422:VAL:HG13	2.01	0.43
2:B:694:LEU:HD21	3:C:9:LEU:HA	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:388:ILE:HD13	3:C:396:MET:HG3	2.00	0.43
1:A:370:LEU:O	2:B:363:ARG:NH2	2.51	0.43
1:A:565:ILE:HD13	3:C:47:LEU:HD22	2.00	0.43
2:B:187:ILE:HD12	2:B:206:MET:HE2	1.99	0.43
2:B:244:ALA:HB2	2:B:410:MET:SD	2.59	0.43
1:A:670:ASP:OD2	2:B:497:ARG:NH1	2.50	0.43
2:B:35:GLY:CA	2:B:228:THR:HG23	2.49	0.43
2:B:210:ASP:OD1	2:B:211:LYS:N	2.45	0.43
5:R:14:G:H2'	5:R:15:A:C8	2.54	0.43
2:B:298:ILE:HD12	2:B:298:ILE:N	2.34	0.42
1:A:141:ASN:OD1	1:A:141:ASN:N	2.51	0.42
3:C:348:ILE:HG22	3:C:349:GLY:N	2.35	0.42
1:A:423:GLU:OE1	1:A:423:GLU:N	2.44	0.42
1:A:585:GLU:OE1	2:B:542:THR:OG1	2.29	0.42
2:B:659:VAL:CG2	3:C:113:PHE:HA	2.50	0.42
3:C:698:PHE:C	3:C:699:LEU:HD22	2.44	0.42
1:A:91:VAL:HG22	2:B:723:MET:CG	2.46	0.42
2:B:262:ILE:HD11	2:B:325:ILE:HG21	2.02	0.42
2:B:272:PRO:HB3	2:B:415:MET:HE1	2.02	0.42
3:C:601:LEU:HD23	3:C:604:MET:HE2	2.00	0.42
9:M:101:GTA:H2A	9:M:101:GTA:O15	2.18	0.42
1:A:484:ARG:NH1	1:A:494:ASP:OD1	2.50	0.42
2:B:289:MET:HE1	2:B:449:PHE:CE1	2.54	0.42
3:C:480:VAL:HG12	3:C:481:VAL:N	2.35	0.42
2:B:24:TYR:OH	6:M:19:C:OP1	2.25	0.41
3:C:572:MET:O	3:C:575:TRP:NE1	2.51	0.41
3:C:598:ARG:O	3:C:602:LYS:HG2	2.21	0.41
1:A:383:ASP:O	2:B:380:ARG:NH2	2.53	0.41
2:B:242:ALA:HB3	2:B:410:MET:HG2	2.02	0.41
2:B:749:ILE:HG23	3:C:13:LEU:CD1	2.50	0.41
3:C:16:ASN:OD1	3:C:16:ASN:N	2.54	0.41
2:B:355:PHE:CD2	2:B:373:LEU:HD11	2.55	0.41
3:C:173:GLU:OE1	3:C:173:GLU:N	2.53	0.41
1:A:438:ARG:HB3	2:B:541:ALA:HB2	2.01	0.41
2:B:254:VAL:HG21	2:B:336:PHE:CE1	2.55	0.41
3:C:383:LEU:C	3:C:383:LEU:HD23	2.46	0.41
5:R:16:A:H2'	5:R:17:A:C8	2.56	0.41
2:B:622:ARG:NE	3:C:105:GLY:O	2.52	0.41
1:A:196:VAL:O	1:A:196:VAL:HG13	2.21	0.41
2:B:170:ILE:HD13	2:B:247:GLN:HA	2.03	0.41
2:B:248:ILE:O	2:B:252:VAL:HG23	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:603:GLN:OE1	3:C:697:GLY:N	2.48	0.41
1:A:560:ASN:OD1	1:A:561:GLY:N	2.45	0.41
2:B:206:MET:SD	2:B:206:MET:N	2.94	0.41
2:B:415:MET:HE2	5:R:12:G:O2'	2.21	0.41
2:B:522:MET:HE1	2:B:551:ILE:HD11	2.03	0.41
3:C:261:MET:HE1	3:C:303:ILE:HG21	2.02	0.41
2:B:113:THR:O	2:B:117:THR:OG1	2.31	0.40
3:C:399:LEU:HD13	3:C:399:LEU:C	2.46	0.40
3:C:240:GLU:O	3:C:673:ARG:NH2	2.54	0.40
3:C:717:LEU:CD2	3:C:728:ILE:HD11	2.47	0.40
1:A:400:ALA:HB1	1:A:402:TRP:CD1	2.56	0.40
1:A:544:LEU:HG	1:A:553:VAL:HG21	2.02	0.40
2:B:728:ASP:OD2	3:C:2:THR:OG1	2.32	0.40
2:B:122:LEU:HB2	2:B:143:LEU:HD22	2.02	0.40
3:C:329:ARG:HB2	3:C:402:LEU:HD11	2.04	0.40

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	A	693/751 (92%)	678 (98%)	15 (2%)	0	100	100
2	B	720/772 (93%)	707 (98%)	13 (2%)	0	100	100
3	C	725/798 (91%)	704 (97%)	20 (3%)	1 (0%)	48	72
All	All	2138/2321 (92%)	2089 (98%)	48 (2%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	292	ASP

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	621/664 (94%)	616 (99%)	5 (1%)	73	85
2	B	625/657 (95%)	619 (99%)	6 (1%)	68	82
3	C	636/694 (92%)	626 (98%)	10 (2%)	55	75
All	All	1882/2015 (93%)	1861 (99%)	21 (1%)	63	80

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	81	GLU
1	A	180	GLU
1	A	265	ILE
1	A	485	VAL
1	A	591	GLU
2	B	42	THR
2	B	408	MET
2	B	430	ILE
2	B	460	GLU
2	B	516	VAL
2	B	722	ARG
3	C	28	ASP
3	C	49	MET
3	C	89	LYS
3	C	186	GLU
3	C	238	GLN
3	C	255	GLU
3	C	332	LEU
3	C	371	GLU
3	C	394	GLU
3	C	739	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	268	HIS
2	B	55	GLN
2	B	156	ASN
2	B	346	ASN
2	B	613	ASN
3	C	251	ASN
3	C	354	GLN
3	C	366	HIS
3	C	421	ASN

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
4	V	11/14 (78%)	2 (18%)	0
5	R	11/21 (52%)	0	0
6	M	11/19 (57%)	1 (9%)	0
All	All	33/54 (61%)	3 (9%)	0

All (3) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
4	V	7	A
4	V	11	A
6	M	4	C

There are no RNA pucker outliers to report.

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](#)

Of 5 ligands modelled in this entry, 3 are monoatomic - leaving 2 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	$\# Z > 2$
9	GTA	M	101	6	56,56,56	1.60	11 (19%)	83,88,88	2.00	23 (27%)
8	G2P	B	801	7	30,34,34	1.00	3 (10%)	46,54,54	0.89	3 (6%)

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
9	GTA	M	101	6	-	8/32/64/64	0/6/6/6
8	G2P	B	801	7	-	12/19/38/38	0/3/3/3

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
9	M	101	GTA	C5-N7	-4.89	1.33	1.39
9	M	101	GTA	C2C-N3C	3.47	1.40	1.33
9	M	101	GTA	C2C-N1C	3.32	1.39	1.33
9	M	101	GTA	C5-C6	-3.32	1.33	1.43
9	M	101	GTA	C5C-N7C	-3.13	1.33	1.39
9	M	101	GTA	C5C-C4C	-3.02	1.33	1.39
8	B	801	G2P	PB-O3B	2.73	1.61	1.58
9	M	101	GTA	C5C-C6C	-2.66	1.33	1.41
9	M	101	GTA	C8C-N9C	-2.49	1.33	1.37
8	B	801	G2P	PA-O1A	-2.17	1.51	1.56
9	M	101	GTA	P1-O13	2.14	1.61	1.59
9	M	101	GTA	C4C-N9C	-2.10	1.33	1.37
8	B	801	G2P	PB-O1B	-2.09	1.51	1.56
9	M	101	GTA	P2-O23	2.05	1.61	1.59

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	M	101	GTA	N3C-C2C-N1C	-6.94	118.08	128.58
9	M	101	GTA	C2-N3-C4	4.92	120.78	112.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	M	101	GTA	C5C-C4C-N3C	-4.40	120.65	126.72
9	M	101	GTA	N9C-C8C-N7C	-4.32	107.80	113.94
9	M	101	GTA	C5-C6-N1	3.81	119.72	111.84
9	M	101	GTA	C2-N1-C6	-3.79	118.24	125.11
9	M	101	GTA	C5-C4-N3	-3.70	121.15	128.15
9	M	101	GTA	C2B-C3B-C4B	-3.59	95.67	102.61
9	M	101	GTA	C2C-N3C-C4C	3.28	119.83	111.83
9	M	101	GTA	O6-C6-C5	-3.25	120.77	128.01
9	M	101	GTA	C3A-C2A-C1A	-3.06	95.67	101.46
9	M	101	GTA	C5C-N7C-C8C	3.03	108.22	103.45
9	M	101	GTA	C3B-C2B-C1B	-2.99	95.81	101.46
9	M	101	GTA	C5C-C6C-N6C	-2.87	116.17	123.29
9	M	101	GTA	C2A-C3A-C4A	-2.67	97.46	102.61
9	M	101	GTA	O4B-C1B-N9C	2.66	113.20	108.09
9	M	101	GTA	N3C-C4C-N9C	2.58	131.56	127.17
9	M	101	GTA	C6C-C5C-C4C	2.58	120.70	117.18
9	M	101	GTA	N9-C4-N3	2.56	131.07	125.95
9	M	101	GTA	C4C-N9C-C8C	2.44	108.30	105.74
8	B	801	G2P	O1A-PA-O2A	2.37	117.68	109.95
9	M	101	GTA	C4C-C5C-N7C	-2.35	107.90	110.58
8	B	801	G2P	O1B-PB-O2B	2.29	117.39	109.95
9	M	101	GTA	N1-C2-N3	-2.20	119.30	123.32
8	B	801	G2P	O3G-PG-O1G	2.07	115.57	107.80
9	M	101	GTA	C4B-O4B-C1B	-2.04	104.97	109.47

There are no chirality outliers.

All (20) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
8	B	801	G2P	PB-O3B-PG-O3G
8	B	801	G2P	PA-C3A-PB-O1B
8	B	801	G2P	PA-C3A-PB-O2B
8	B	801	G2P	PB-C3A-PA-O2A
8	B	801	G2P	PB-C3A-PA-O5'
8	B	801	G2P	C5'-O5'-PA-O2A
9	M	101	GTA	C5B-O33-P3-O32
9	M	101	GTA	O4A-C4A-C5A-O15
8	B	801	G2P	C3'-C4'-C5'-O5'
8	B	801	G2P	O4'-C4'-C5'-O5'
9	M	101	GTA	C3A-C4A-C5A-O15
9	M	101	GTA	O4B-C4B-C5B-O33
8	B	801	G2P	PA-C3A-PB-O3B

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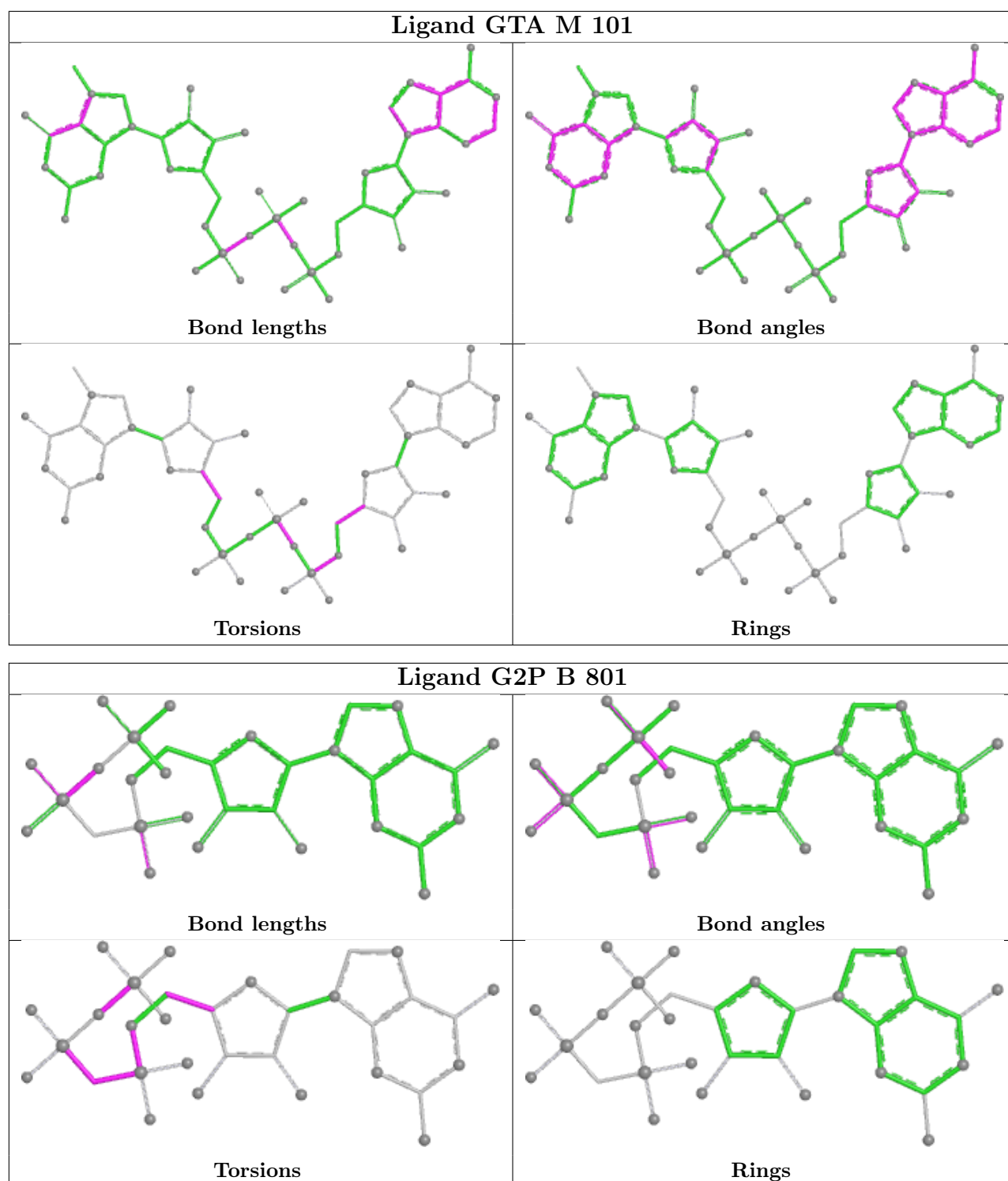
Mol	Chain	Res	Type	Atoms
8	B	801	G2P	PB-C3A-PA-O1A
9	M	101	GTA	C5B-O33-P3-O23
9	M	101	GTA	C5B-O33-P3-O31
8	B	801	G2P	PB-O3B-PG-O1G
9	M	101	GTA	P3-O23-P2-O22
9	M	101	GTA	P3-O23-P2-O21
8	B	801	G2P	C5'-O5'-PA-C3A

There are no ring outliers.

1 monomer is involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	M	101	GTA	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.



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

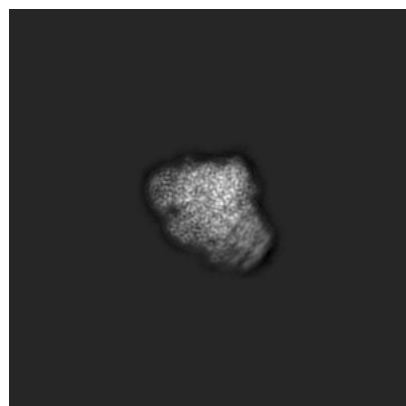
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-16013. These allow visual inspection of the internal detail of the map and identification of artifacts.

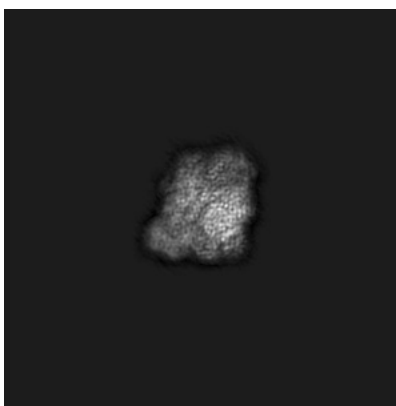
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

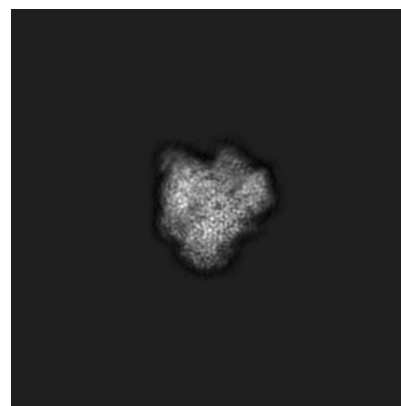
6.1.1 Primary map



X

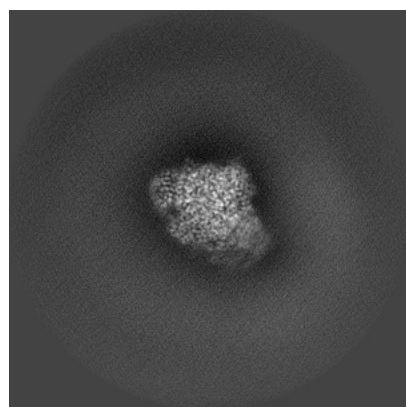


Y

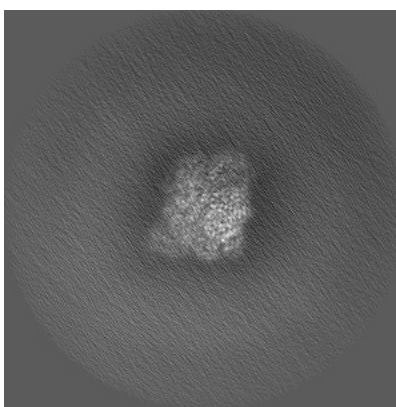


Z

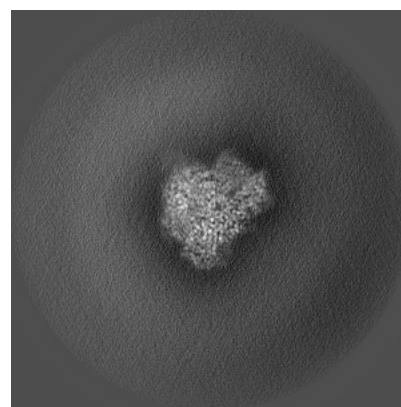
6.1.2 Raw map



X



Y

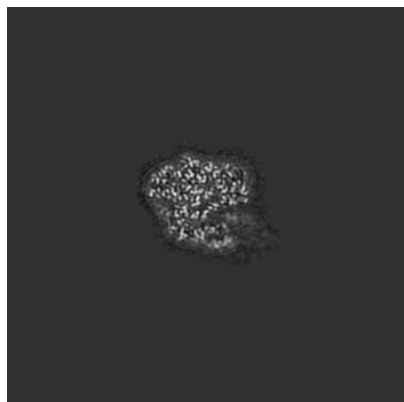


Z

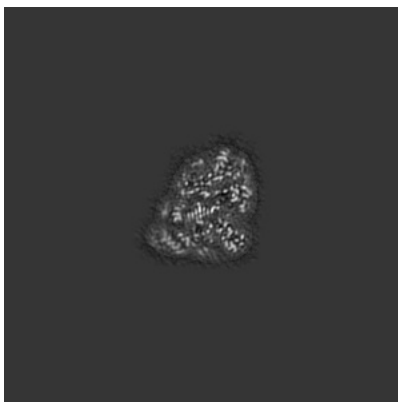
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

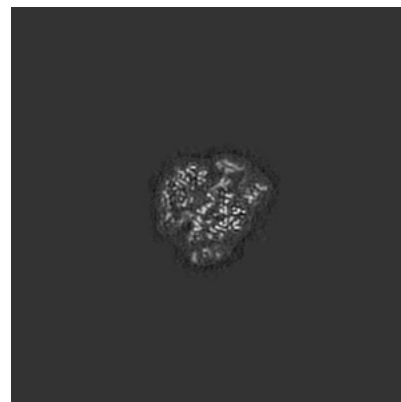
6.2.1 Primary map



X Index: 230

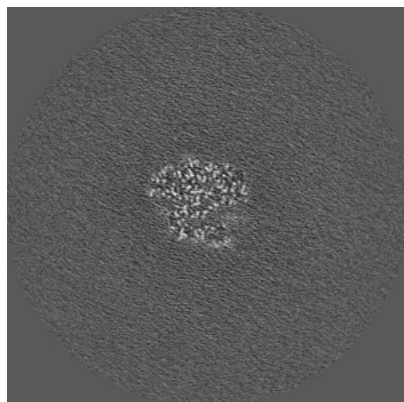


Y Index: 230

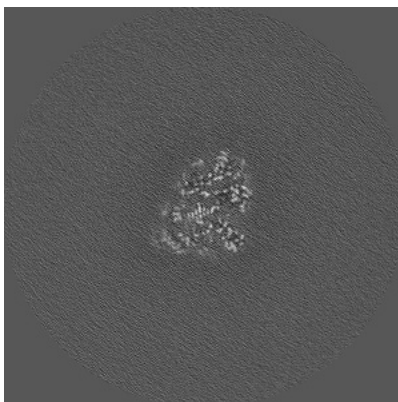


Z Index: 230

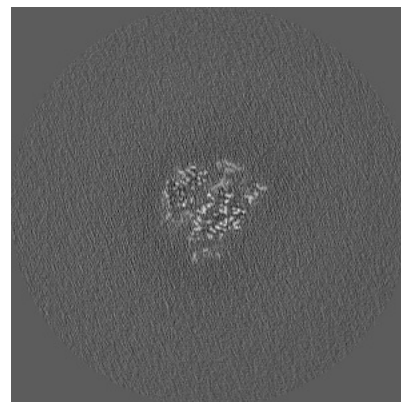
6.2.2 Raw map



X Index: 230



Y Index: 230

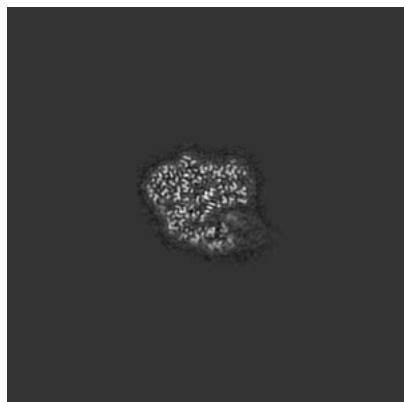


Z Index: 230

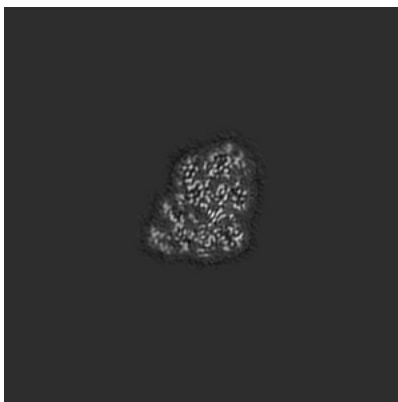
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

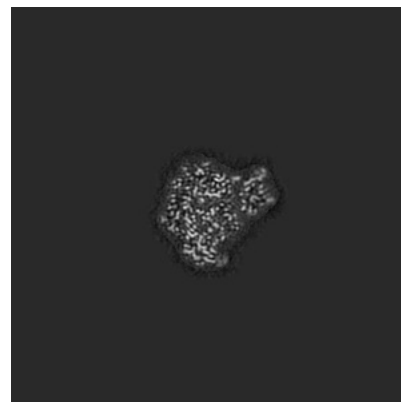
6.3.1 Primary map



X Index: 228

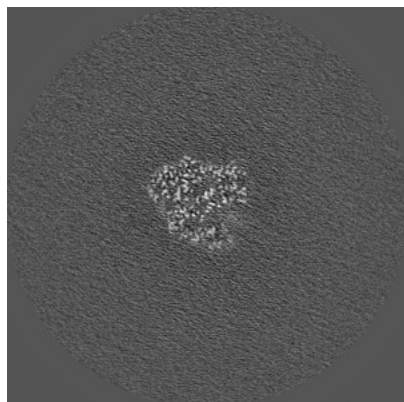


Y Index: 239

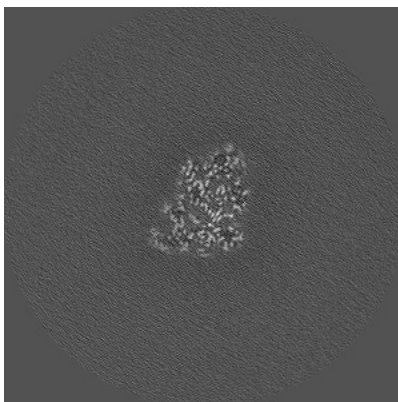


Z Index: 260

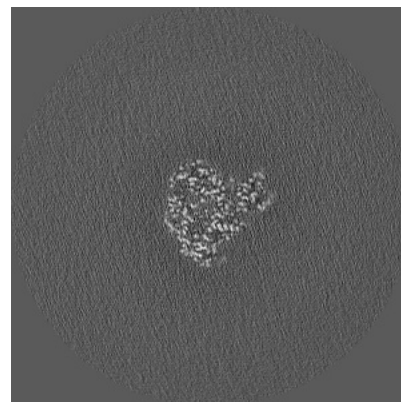
6.3.2 Raw map



X Index: 228



Y Index: 238

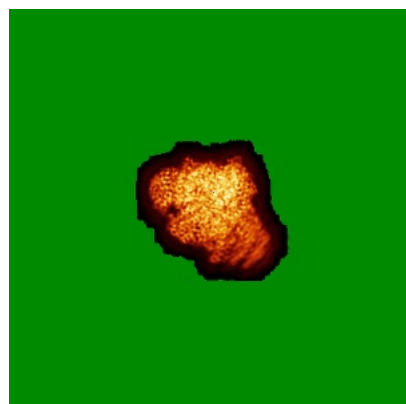


Z Index: 254

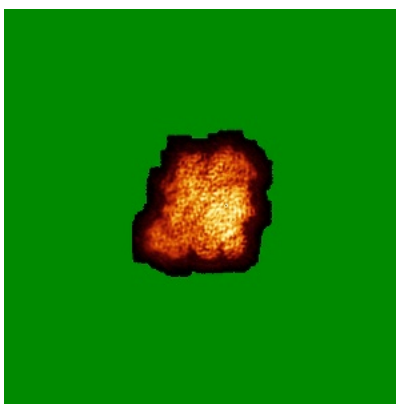
The images above show the largest variance slices of the map in three orthogonal directions.

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

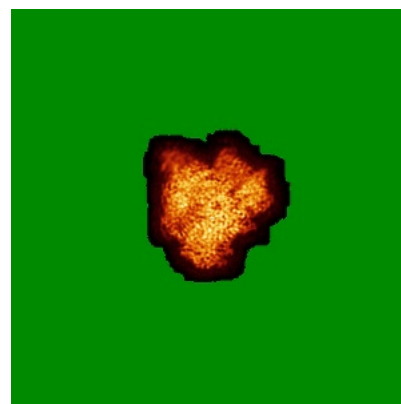
6.4.1 Primary map



X

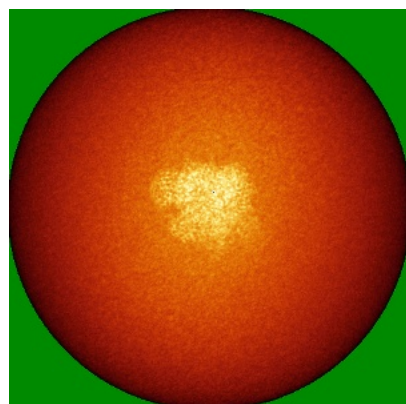


Y

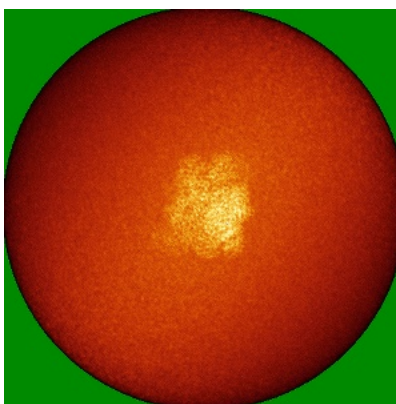


Z

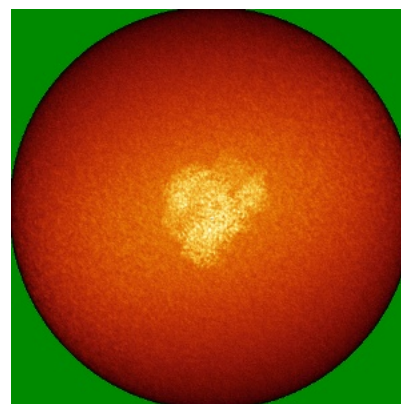
6.4.2 Raw map



X



Y

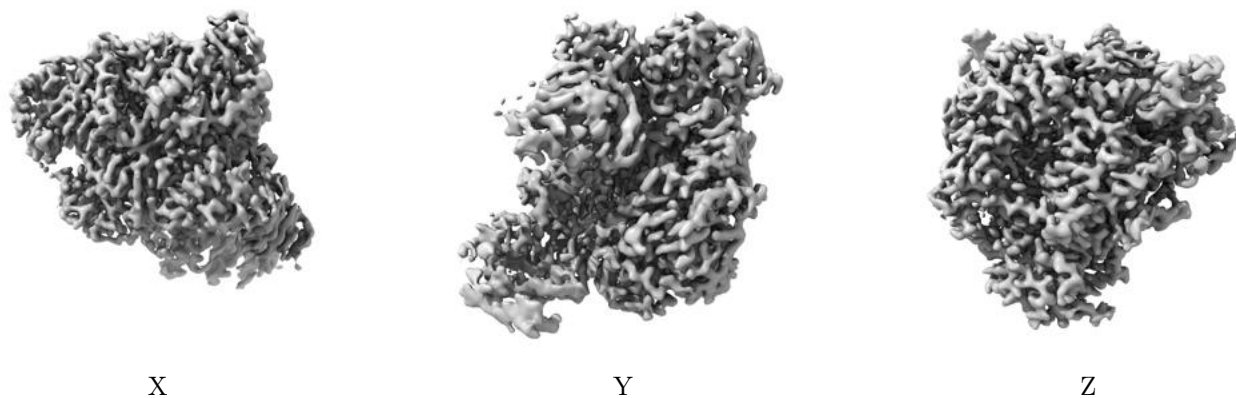


Z

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.

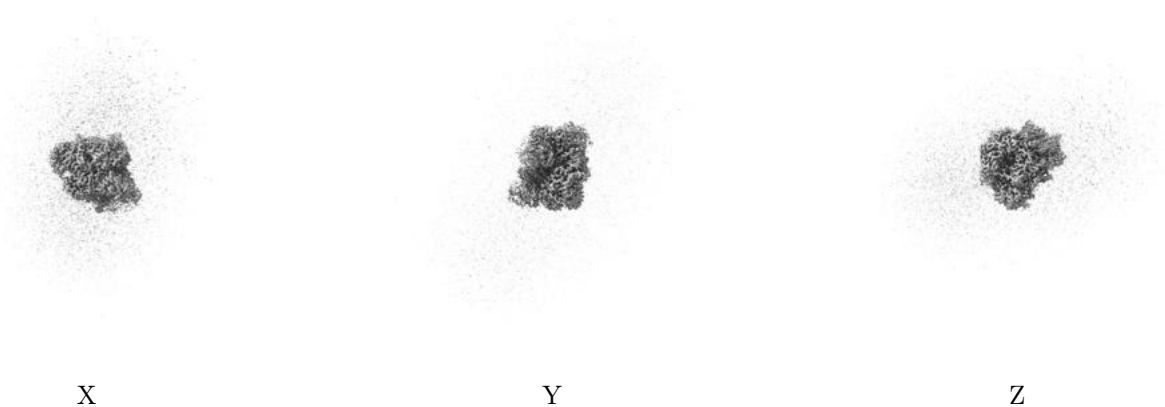
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.22. 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.

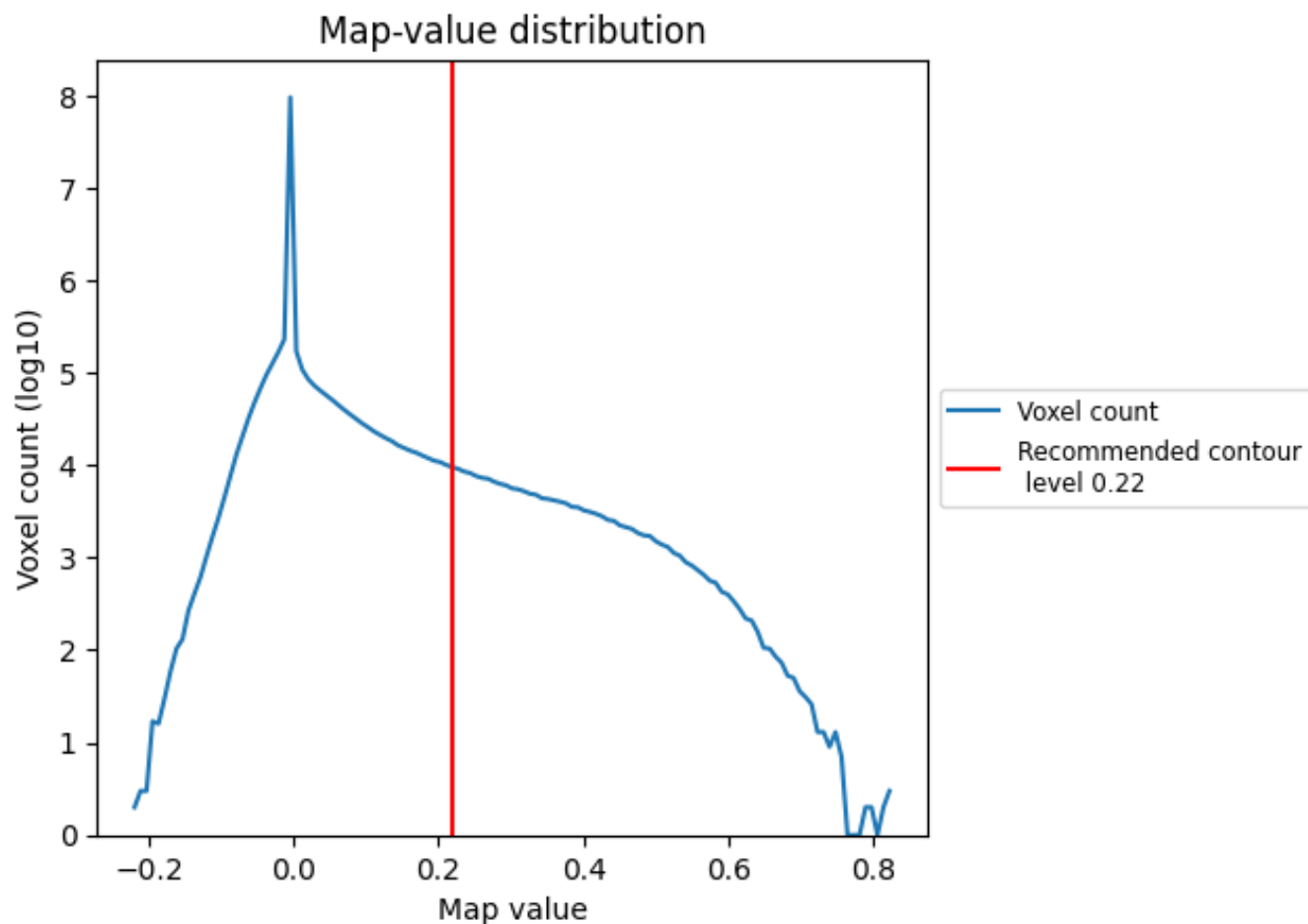
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

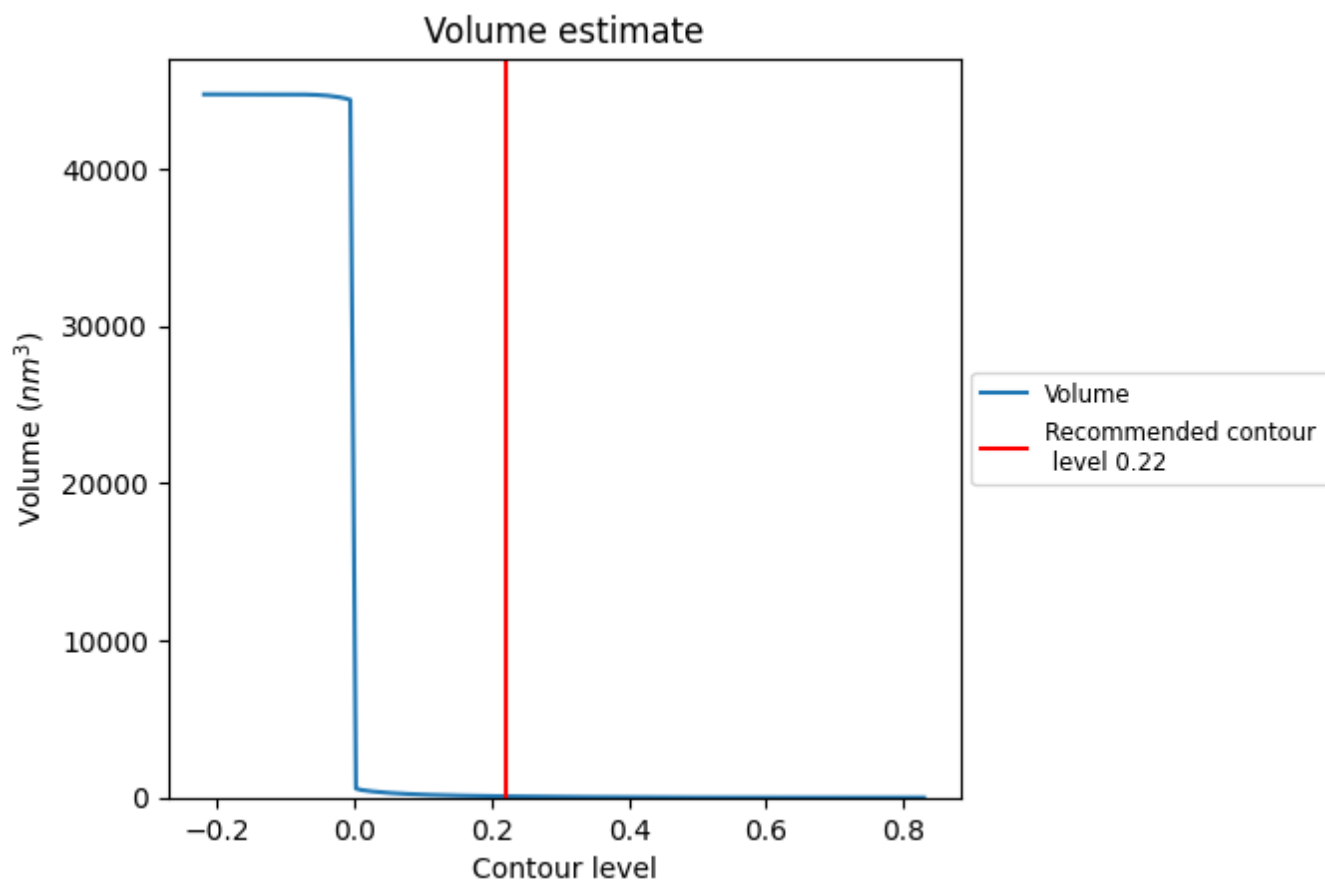
This section contains the results of statistical analysis of the map.

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.

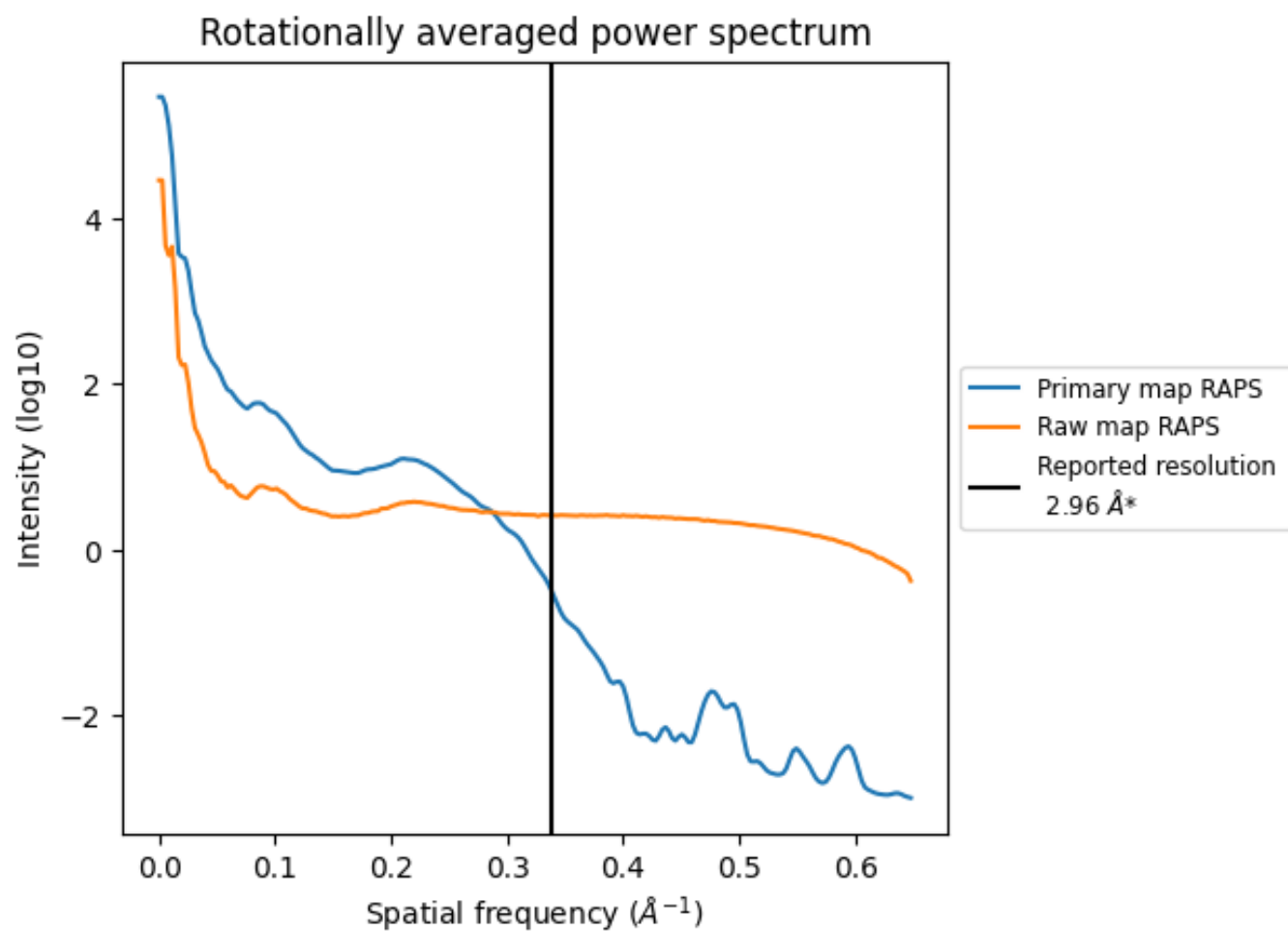
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 79 nm³; this corresponds to an approximate mass of 71 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 ⓘ

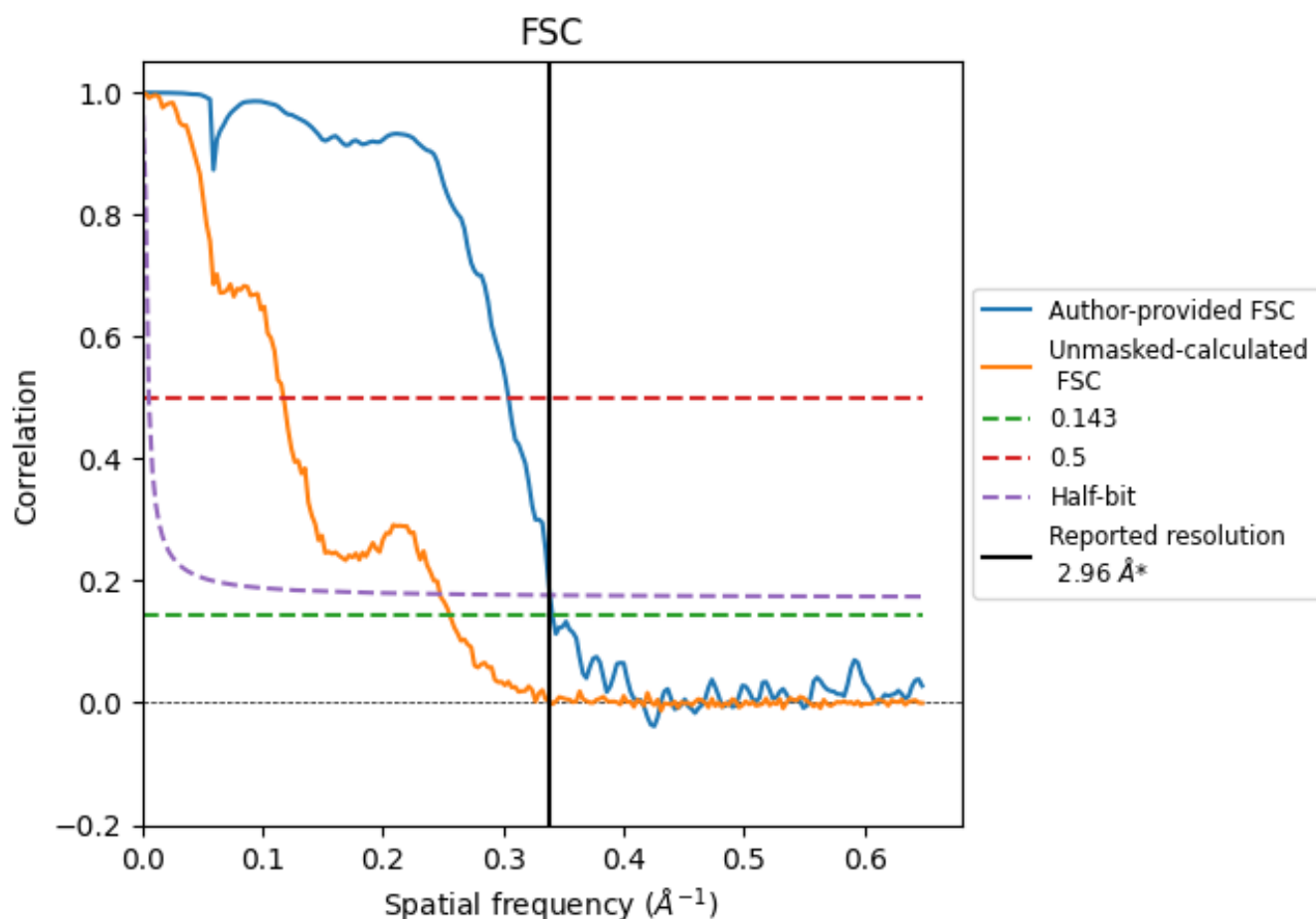


*Reported resolution corresponds to spatial frequency of $0.338 \text{ \AA}^{-1}$

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 0.338 $\text{\AA}^{-1}$

8.2 Resolution estimates [i](#)

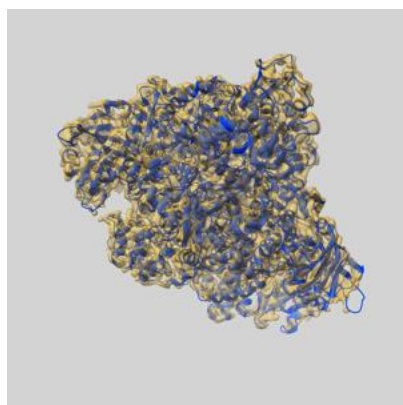
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.96	-	-
Author-provided FSC curve	2.94	3.29	2.95
Unmasked-calculated*	3.91	8.52	4.04

*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 3.91 differs from the reported value 2.96 by more than 10 %

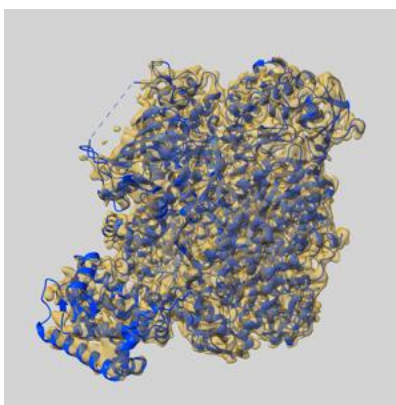
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-16013 and PDB model 8BF5. Per-residue inclusion information can be found in section [3](#) on page [9](#).

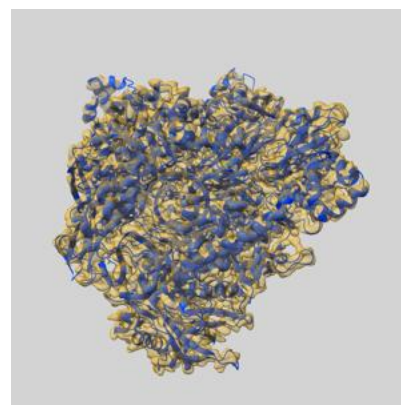
9.1 Map-model overlay [i](#)



X



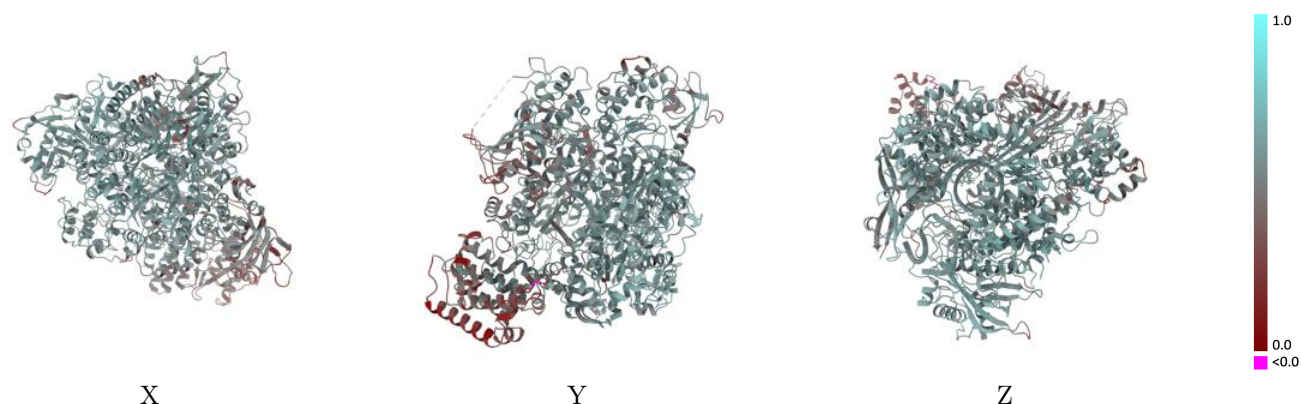
Y



Z

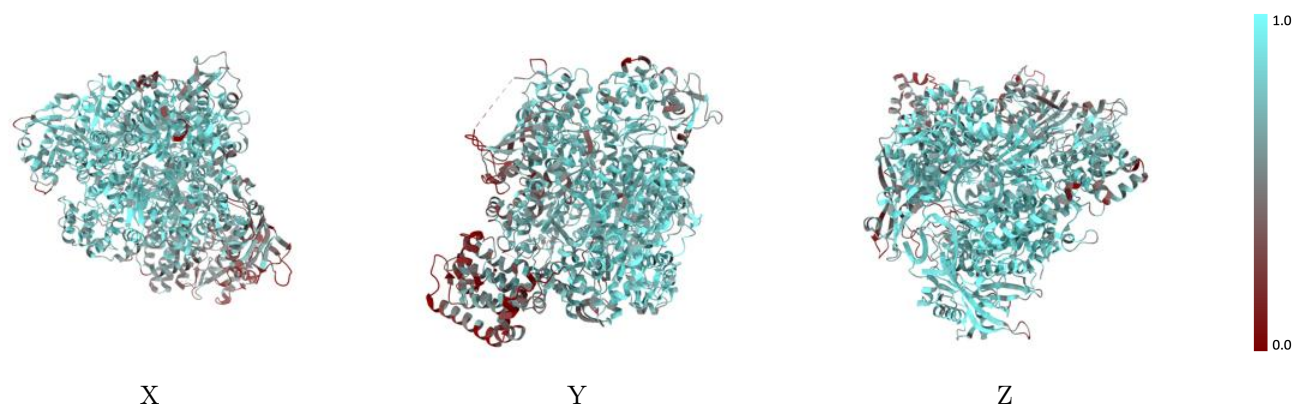
The images above show the 3D surface view of the map at the recommended contour level 0.22 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



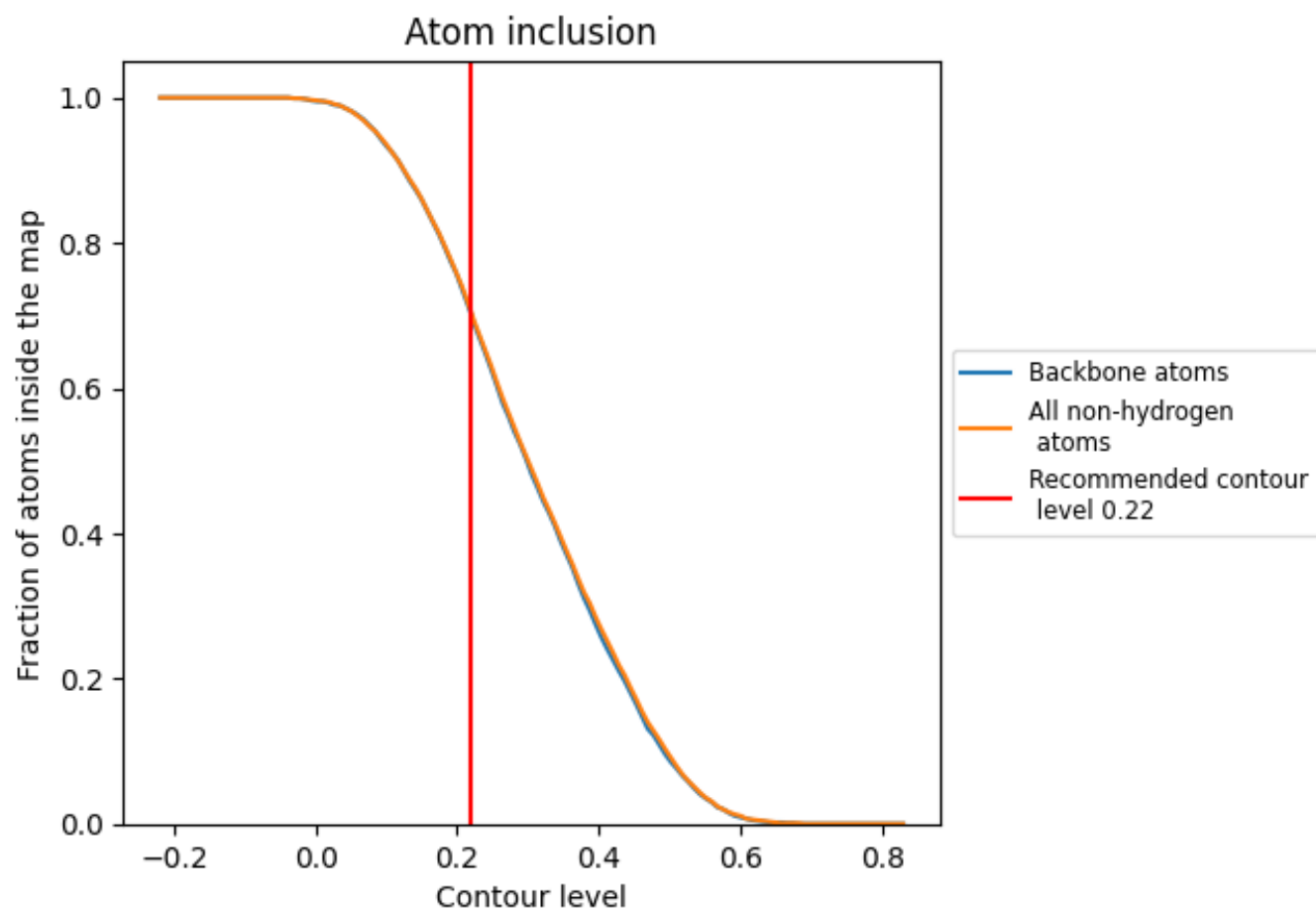
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.22).

9.4 Atom inclusion [i](#)



At the recommended contour level, 70% of all backbone atoms, 70% 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 (0.22) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7050	0.5400
A	0.6820	0.5220
B	0.7870	0.5740
C	0.6640	0.5220
M	0.7610	0.5300
R	0.8890	0.5850
V	0.9050	0.5740

1.0

0.0

<0.0