



## Full wwPDB EM Validation Report ⓘ

Jun 30, 2026 – 12:50 PM JST

PDB ID : 9WXJ / pdb\_00009wxj  
EMDB ID : EMD-66348  
Title : Cryo-EM structure of the type III-D2 CRISPR-Cas effector complex bound to a non-cognate target RNA in the pre-cleavage state  
Authors : Mitsuda, Y.; Ishikawa, J.; Nagahata, N.; Hiraizumi, M.; Yamashita, K.; Nishimasu, H.  
Deposited on : 2025-09-25  
Resolution : 2.70 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](mailto: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>.

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

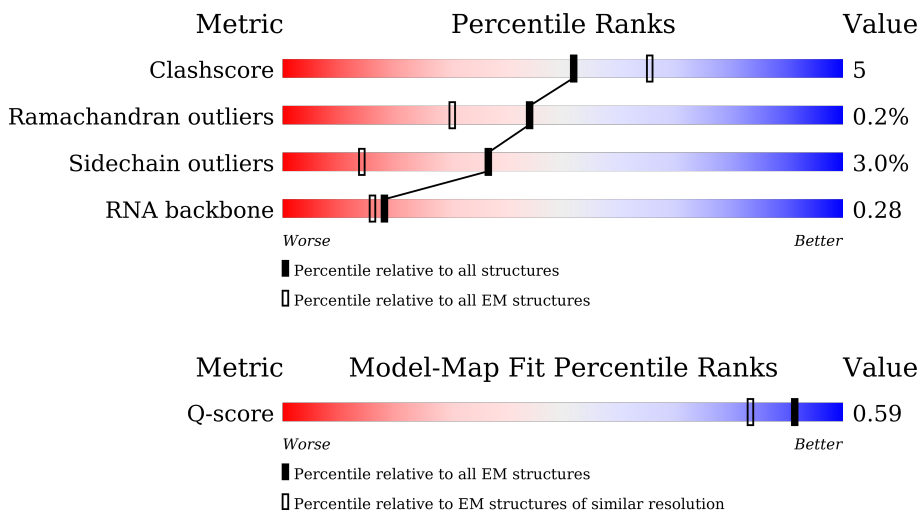
EMDB validation analysis : 0.0.1.dev133  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
MolProbity : 4-5-2 with Phenix2.0  
Buster-report : wwPDB partial adaption of 1.1.7 (2018)  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
EM percentile statistics : 202505.v01 (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) : 2.50

# 1 Overall quality at a glance i

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

The reported resolution of this entry is 2.70 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.



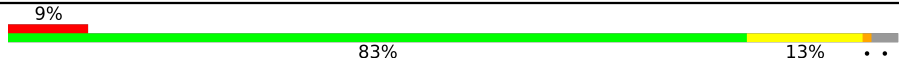

Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
RNA backbone	8273	3508	-
Q-score	-	25397	10327 ( 2.20 - 3.20 )

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  $\geq 3$ , 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	43	
2	B	592	
3	C	635	

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Mol	Chain	Length	Quality of chain
4	D	1235	
5	E	47	

## 2 Entry composition

There are 10 unique types of molecules in this entry. The entry contains 19909 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 RNA chain called CRISPR RNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
1	A	39	819	368	136	277	38	0	0

- Molecule 2 is a protein called Cas10.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	478	3895	2465	676	742	12	0	0

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-19	MET	-	initiating methionine	UNP A0A9D0P2E0
B	-18	GLY	-	expression tag	UNP A0A9D0P2E0
B	-17	SER	-	expression tag	UNP A0A9D0P2E0
B	-16	SER	-	expression tag	UNP A0A9D0P2E0
B	-15	HIS	-	expression tag	UNP A0A9D0P2E0
B	-14	HIS	-	expression tag	UNP A0A9D0P2E0
B	-13	HIS	-	expression tag	UNP A0A9D0P2E0
B	-12	HIS	-	expression tag	UNP A0A9D0P2E0
B	-11	HIS	-	expression tag	UNP A0A9D0P2E0
B	-10	HIS	-	expression tag	UNP A0A9D0P2E0
B	-9	SER	-	expression tag	UNP A0A9D0P2E0
B	-8	SER	-	expression tag	UNP A0A9D0P2E0
B	-7	GLY	-	expression tag	UNP A0A9D0P2E0
B	-6	LEU	-	expression tag	UNP A0A9D0P2E0
B	-5	VAL	-	expression tag	UNP A0A9D0P2E0
B	-4	PRO	-	expression tag	UNP A0A9D0P2E0
B	-3	ARG	-	expression tag	UNP A0A9D0P2E0
B	-2	GLY	-	expression tag	UNP A0A9D0P2E0
B	-1	SER	-	expression tag	UNP A0A9D0P2E0
B	0	HIS	-	expression tag	UNP A0A9D0P2E0

- Molecule 3 is a protein called CRISPR type III-associated protein domain-containing protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	626	4912	3132	828	935	17	0	0

- Molecule 4 is a protein called TIGR03986 family CRISPR-associated RAMP protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	D	1194	9432	5911	1699	1790	32	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	0	SER	-	expression tag	UNP A0A9D0P2B2

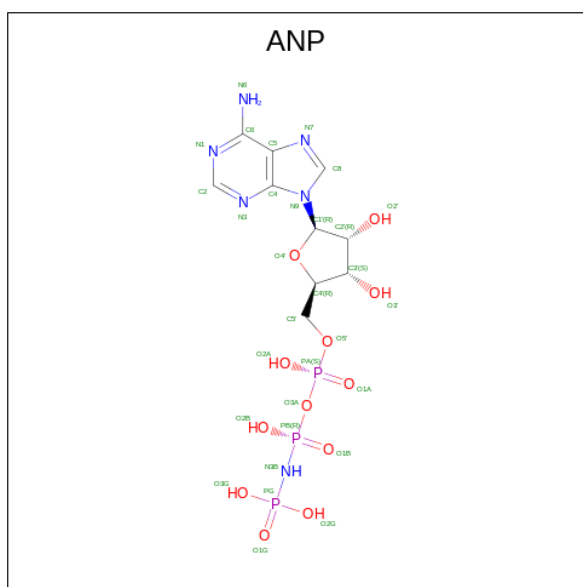
- Molecule 5 is a RNA chain called Non-cognate target RNA (NTR).

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
5	E	37	789	354	145	253	37	0	0

- Molecule 6 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

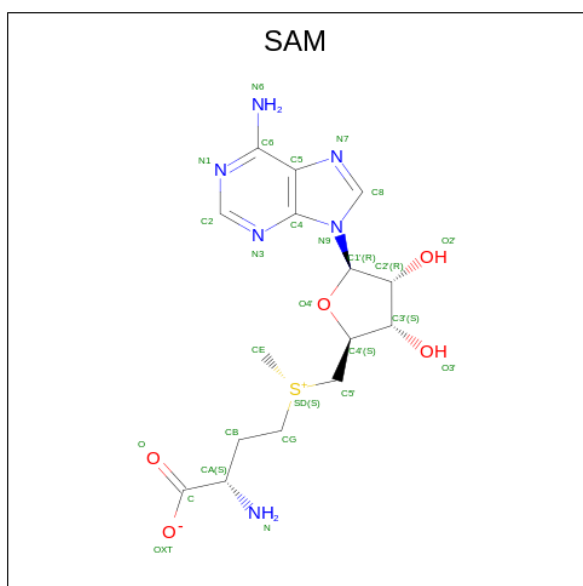
Mol	Chain	Residues	Atoms		AltConf
6	B	1	Total	Mg	0
			1	1	
6	C	1	Total	Mg	0
			1	1	

- Molecule 7 is PHOSPHOAMINOPHOSPHONIC ACID-ADENYLATE ESTER (CCD ID: ANP) (formula: C<sub>10</sub>H<sub>17</sub>N<sub>6</sub>O<sub>12</sub>P<sub>3</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
7	B	1	31	10	6	12	3	0

- Molecule 8 is S-ADENOSYLMETHIONINE (CCD ID: SAM) (formula:  $C_{15}H_{22}N_6O_5S$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	S	
8	C	1	27	15	6	5	1	0

- Molecule 9 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

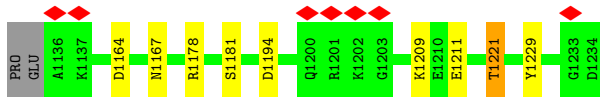
Mol	Chain	Residues	Atoms		AltConf
9	D	1	Total 1	Zn 1	0

- Molecule 10 is water.

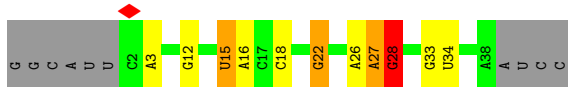
Mol	Chain	Residues	Atoms		AltConf
10	B	1	Total 1	O 1	0







- Molecule 5: Non-cognate target RNA (NTR)



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	135266	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	50.600	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	1.450	Depositor
Minimum map value	-0.723	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.029	Depositor
Recommended contour level	0.126	Depositor
Map size (Å)	298.8, 298.8, 298.8	wwPDB
Map dimensions	300, 300, 300	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.99599993, 0.99599993, 0.99599993	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: ANP, MG, SAM, ZN

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	0.71	0/913	1.62	23/1419 (1.6%)
2	B	0.51	0/3969	0.90	1/5345 (0.0%)
3	C	0.57	0/5032	0.92	3/6845 (0.0%)
4	D	0.60	0/9647	0.98	13/13041 (0.1%)
5	E	0.57	0/883	1.16	5/1373 (0.4%)
All	All	0.58	0/20444	1.01	45/28023 (0.2%)

There are no bond length outliers.

All (45) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	30	C	O3'-P-O5'	-13.66	83.51	104.00
1	A	5	A	O3'-P-O5'	-12.10	85.85	104.00
1	A	12	U	O3'-P-O5'	-10.88	87.68	104.00
1	A	4	G	O3'-P-O5'	-9.98	89.02	104.00
1	A	3	U	O3'-P-O5'	-8.66	91.01	104.00
1	A	17	G	O3'-P-O5'	-7.59	92.62	104.00
4	D	175	MET	CG-SD-CE	-7.42	84.58	100.90
1	A	11	G	O3'-P-O5'	-7.21	93.19	104.00
2	B	328	ASP	CA-CB-CG	7.21	119.81	112.60
1	A	35	G	O3'-P-O5'	-7.07	93.40	104.00
4	D	465	THR	CA-CB-OG1	-7.00	99.09	109.60
4	D	1221	THR	CA-CB-OG1	-6.79	99.42	109.60
1	A	21	U	O3'-P-O5'	-6.75	93.88	104.00
1	A	23	G	O3'-P-O5'	-6.49	94.27	104.00
1	A	18	A	O3'-P-O5'	-6.34	94.48	104.00
4	D	418	LYS	CB-CA-C	-6.31	101.10	110.62
5	E	15	U	O3'-P-O5'	-6.14	94.79	104.00
1	A	9	U	C2'-C3'-O3'	-6.11	100.33	109.50
4	D	561	ASP	CA-CB-CG	6.08	118.68	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	18	THR	CA-CB-OG1	-6.04	100.55	109.60
1	A	31	U	O3'-P-O5'	-5.92	95.11	104.00
1	A	25	U	O3'-P-O5'	-5.87	95.19	104.00
1	A	7	A	O3'-P-O5'	5.83	112.75	104.00
4	D	235	ASP	CA-CB-CG	5.76	118.36	112.60
4	D	631	ARG	NE-CZ-NH2	-5.76	114.01	119.20
1	A	6	A	O3'-P-O5'	5.76	112.64	104.00
1	A	29	C	C3'-C2'-O2'	-5.67	106.09	114.60
4	D	931	ASP	CA-CB-CG	5.66	118.26	112.60
4	D	152	ASP	CA-CB-CG	5.60	118.20	112.60
5	E	28	G	C2'-C3'-O3'	-5.54	105.40	113.70
1	A	27	A	C1'-O4'-C4'	-5.53	104.17	109.70
1	A	9	U	C1'-O4'-C4'	-5.47	104.23	109.70
1	A	24	G	C2'-C3'-O3'	-5.40	105.60	113.70
5	E	33	G	C2'-C3'-O3'	5.39	117.58	109.50
5	E	27	A	O3'-P-O5'	5.31	111.97	104.00
3	C	430	TYR	N-CA-CB	-5.24	101.83	111.37
4	D	488	ASP	CA-CB-CG	5.22	117.82	112.60
4	D	553	TYR	CB-CA-C	-5.20	98.01	109.56
4	D	1194	ASP	CA-CB-CG	5.20	117.80	112.60
5	E	26	A	O3'-P-O5'	5.12	111.69	104.00
1	A	2	U	O3'-P-O5'	-5.08	96.39	104.00
4	D	152	ASP	CB-CA-C	-5.04	101.35	109.72
1	A	29	C	C4'-C3'-O3'	5.04	116.95	109.40
3	C	437	THR	CA-CB-OG1	-5.03	102.06	109.60
1	A	13	C	C4'-C3'-O3'	5.01	116.92	109.40

There are no chirality outliers.

There are no planarity outliers.

## 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	819	0	416	11	0
2	B	3895	0	3855	53	0
3	C	4912	0	4864	63	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	D	9432	0	9215	96	0
5	E	789	0	400	4	0
6	B	1	0	0	0	0
6	C	1	0	0	0	0
7	B	31	0	13	0	0
8	C	27	0	22	0	0
9	D	1	0	0	0	0
10	B	1	0	0	0	0
All	All	19909	0	18785	207	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 (207) 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:D:435:ALA:HB2	4:D:470:ILE:HG21	1.62	0.82
4:D:79:PHE:CE2	4:D:186:ALA:HB2	2.21	0.76
3:C:376:ARG:HG3	4:D:9:TRP:CE2	2.21	0.76
2:B:171:TYR:HB3	2:B:298:ASP:O	1.88	0.73
2:B:284:TYR:OH	2:B:348:GLU:OE2	2.07	0.73
4:D:688:PHE:O	4:D:692:LYS:HG2	1.92	0.70
2:B:118:ILE:HD11	2:B:128:GLU:HB2	1.72	0.70
2:B:248:PHE:CE1	2:B:252:ASN:ND2	2.59	0.70
4:D:549:HIS:ND1	4:D:913:LYS:NZ	2.40	0.68
2:B:331:TRP:CZ2	2:B:357:ARG:HB3	2.27	0.68
4:D:705:LEU:O	4:D:724:ILE:N	2.26	0.64
4:D:175:MET:HB2	4:D:179:ASP:HB2	1.81	0.63
2:B:15:PHE:O	2:B:235:ARG:NH1	2.31	0.63
4:D:730:ILE:HA	4:D:748:GLU:OE1	1.99	0.62
3:C:289:ALA:HB1	3:C:399:TRP:HB3	1.82	0.61
4:D:610:PRO:HG2	4:D:613:SER:OG	2.00	0.61
4:D:623:GLU:OE2	4:D:631:ARG:HD3	1.99	0.61
4:D:649:ARG:O	4:D:670:LEU:HG	2.00	0.61
4:D:692:LYS:HD2	4:D:703:TYR:OH	2.00	0.61
4:D:363:LYS:O	4:D:420:ARG:NH2	2.27	0.61
3:C:204:PRO:HA	3:C:423:THR:HG21	1.81	0.61
2:B:238:TYR:O	2:B:244:VAL:HG21	2.01	0.60
3:C:391:GLN:HE21	3:C:435:THR:HG21	1.67	0.59
3:C:276:GLN:OE1	3:C:420:GLN:NE2	2.36	0.59
3:C:522:TYR:CE1	3:C:526:VAL:HG21	2.38	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:D:726:GLY:HA2	4:D:753:VAL:HG22	1.84	0.58
2:B:394:SER:HA	2:B:431:ALA:O	2.03	0.58
3:C:125:GLU:O	4:D:420:ARG:HD2	2.04	0.58
1:A:15:U:H5	3:C:118:ASP:OD2	1.86	0.58
4:D:90:GLU:HG2	4:D:95:LYS:HD3	1.86	0.58
3:C:226:PHE:HB3	3:C:437:THR:HG21	1.85	0.57
2:B:2:ASN:O	2:B:165:PRO:HD2	2.05	0.57
3:C:12:LEU:CD2	3:C:188:VAL:HG22	2.35	0.57
2:B:271:ALA:HB2	2:B:356:TRP:CZ3	2.40	0.56
1:A:21:U:OP2	4:D:140:SER:OG	2.24	0.56
3:C:374:ILE:O	3:C:376:ARG:NH2	2.38	0.56
2:B:286:ASP:OD2	2:B:420:LYS:HE2	2.05	0.56
2:B:416:ASP:OD1	2:B:417:GLY:N	2.39	0.56
4:D:498:THR:O	4:D:499:ASN:C	2.48	0.55
3:C:263:GLN:NE2	3:C:265:ASP:OD1	2.39	0.55
4:D:725:CYS:SG	4:D:753:VAL:O	2.61	0.55
2:B:300:VAL:O	2:B:304:ARG:HG3	2.06	0.55
4:D:336:ALA:N	4:D:485:ASN:O	2.38	0.55
4:D:988:ARG:HD3	4:D:992:ASP:OD1	2.07	0.54
2:B:289:LYS:O	2:B:293:LYS:HG2	2.07	0.54
1:A:8:C:OP2	3:C:376:ARG:NH1	2.40	0.54
4:D:677:LYS:HA	4:D:747:HIS:CD2	2.42	0.54
2:B:309:GLN:OE1	2:B:375:LEU:HD12	2.07	0.53
2:B:37:GLU:O	2:B:41:GLU:HB2	2.07	0.53
3:C:73:TRP:CE3	3:C:165:LYS:HD3	2.44	0.53
4:D:1211:GLU:HB2	4:D:1229:TYR:OH	2.09	0.53
3:C:6:LEU:HD22	3:C:164:LEU:HD22	1.91	0.53
2:B:196:ASN:O	3:C:536:PRO:HD2	2.09	0.52
3:C:157:THR:HG21	3:C:163:ILE:HD12	1.90	0.52
3:C:53:GLN:HG3	4:D:9:TRP:CD2	2.44	0.52
4:D:655:PHE:HE2	4:D:664:VAL:HG23	1.74	0.52
4:D:720:LEU:HB3	4:D:723:ARG:HG3	1.92	0.52
3:C:62:VAL:O	3:C:65:ARG:O	2.28	0.52
2:B:356:TRP:CD1	2:B:357:ARG:HG2	2.44	0.52
3:C:376:ARG:HG3	4:D:9:TRP:CD2	2.44	0.51
3:C:50:LYS:HE3	3:C:176:GLN:O	2.11	0.51
4:D:156:HIS:HB3	5:E:22:G:C4	2.46	0.51
2:B:322:LEU:HD23	2:B:325:ILE:HD11	1.92	0.51
2:B:507:LYS:O	2:B:510:LYS:HG2	2.11	0.51
1:A:35:G:H3'	4:D:856:SER:HB3	1.93	0.51
2:B:509:ARG:O	2:B:512:ILE:HG12	2.11	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:609:MET:O	3:C:610:ASP:C	2.55	0.50
2:B:40:VAL:HG11	2:B:127:PHE:CE2	2.45	0.50
3:C:596:ALA:HA	3:C:600:TYR:O	2.11	0.50
5:E:15:U:H2'	5:E:15:U:O2	2.11	0.50
2:B:241:GLY:O	2:B:244:VAL:HG22	2.12	0.50
1:A:38:U:OP2	4:D:747:HIS:CE1	2.65	0.50
4:D:279:ASP:HB3	4:D:460:GLU:HB2	1.94	0.50
1:A:4:G:N2	3:C:86:SER:OG	2.45	0.50
4:D:121:PRO:O	4:D:307:ARG:NH1	2.45	0.50
4:D:707:ALA:O	4:D:708:ASP:HB2	2.12	0.50
4:D:706:SER:O	4:D:709:PHE:HD2	1.95	0.49
2:B:31:LEU:HG	2:B:238:TYR:CD2	2.47	0.49
4:D:21:THR:OG1	4:D:212:LEU:HD11	2.12	0.49
2:B:374:ARG:HD3	2:B:386:ILE:HG23	1.95	0.49
4:D:700:ASN:ND2	4:D:764:ARG:HG3	2.27	0.49
2:B:262:LYS:HG2	2:B:266:GLN:OE1	2.12	0.49
3:C:258:SER:OG	3:C:267:ARG:O	2.23	0.49
3:C:135:VAL:HG22	5:E:28:G:C6	2.47	0.49
3:C:291:PRO:O	3:C:299:PRO:HG2	2.13	0.49
4:D:1072:LYS:N	4:D:1073:PRO:HD2	2.28	0.49
3:C:216:VAL:HG13	3:C:444:LEU:O	2.14	0.48
2:B:259:LYS:O	2:B:336:ARG:HA	2.13	0.48
2:B:322:LEU:HA	2:B:325:ILE:HG12	1.95	0.48
3:C:3:LYS:HB2	3:C:156:PHE:CE1	2.49	0.48
4:D:670:LEU:HD11	4:D:842:TYR:HE1	1.79	0.48
3:C:358:GLU:HG2	3:C:359:TRP:HD1	1.78	0.48
2:B:364:ARG:O	2:B:368:LEU:HD12	2.14	0.48
4:D:426:GLU:HB3	4:D:430:ARG:NH1	2.27	0.48
4:D:648:LEU:HD22	4:D:844:ASP:HB2	1.94	0.48
2:B:450:LYS:HG2	2:B:460:LEU:HD11	1.97	0.47
2:B:429:MET:HE3	2:B:464:LEU:HB3	1.97	0.47
3:C:56:GLU:OE1	4:D:9:TRP:HD1	1.96	0.47
3:C:28:LEU:HD13	3:C:138:GLU:HB2	1.96	0.47
3:C:115:LEU:HB3	3:C:139:ASN:O	2.14	0.47
4:D:365:THR:O	4:D:365:THR:CG2	2.63	0.47
2:B:26:ARG:HD3	2:B:245:TYR:CE2	2.50	0.47
2:B:390:PHE:HD1	2:B:428:ASN:OD1	1.98	0.47
2:B:460:LEU:N	2:B:461:PRO:CD	2.78	0.47
4:D:91:ARG:NH1	4:D:179:ASP:OD2	2.48	0.47
4:D:392:HIS:HB3	4:D:948:LEU:HD21	1.97	0.47
4:D:384:GLN:NE2	4:D:583:SER:O	2.48	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:458:ASP:OD1	2:B:458:ASP:N	2.46	0.46
4:D:350:LEU:HD22	4:D:359:THR:HG21	1.97	0.46
4:D:656:LYS:HE3	4:D:661:TRP:CZ2	2.50	0.46
4:D:953:LEU:N	4:D:953:LEU:CD2	2.79	0.46
2:B:205:ASN:ND2	2:B:208:THR:OG1	2.48	0.46
4:D:566:HIS:O	4:D:1088:THR:HA	2.16	0.46
4:D:924:ASP:O	4:D:927:ILE:CG1	2.64	0.46
4:D:396:LYS:HG3	4:D:634:ASP:HB2	1.97	0.46
4:D:156:HIS:HB3	5:E:22:G:C5	2.51	0.46
2:B:457:SER:OG	2:B:462:ASP:OD2	2.28	0.46
4:D:705:LEU:HD12	4:D:724:ILE:HB	1.98	0.46
4:D:390:ARG:HB2	4:D:630:LEU:HD23	1.98	0.45
3:C:100:ASP:OD2	3:C:369:ARG:NH1	2.42	0.45
4:D:43:ASP:C	4:D:43:ASP:OD2	2.59	0.45
1:A:2:U:H6	1:A:2:U:O5'	2.00	0.45
4:D:39:ILE:HD13	4:D:137:ILE:HD11	1.98	0.45
4:D:707:ALA:O	4:D:708:ASP:CB	2.65	0.45
2:B:118:ILE:HA	2:B:304:ARG:HG2	1.98	0.45
4:D:502:ASP:O	4:D:503:LYS:HB2	2.17	0.45
4:D:922:SER:OG	4:D:924:ASP:OD1	2.32	0.45
2:B:40:VAL:HA	2:B:143:LEU:HD21	1.99	0.44
3:C:593:PRO:HG2	3:C:594:PHE:CE2	2.52	0.44
4:D:700:ASN:ND2	4:D:764:ARG:CG	2.80	0.44
4:D:759:ASP:CG	4:D:762:ILE:HG22	2.43	0.44
4:D:220:CYS:SG	4:D:246:LEU:HD11	2.57	0.44
4:D:805:GLY:O	4:D:808:ASN:CG	2.60	0.44
2:B:271:ALA:HB2	2:B:356:TRP:CH2	2.53	0.44
2:B:330:ASP:CG	2:B:357:ARG:NH1	2.76	0.44
3:C:97:TYR:HE1	3:C:435:THR:O	2.00	0.44
3:C:425:VAL:HG21	3:C:443:LEU:HD11	2.00	0.44
3:C:358:GLU:HG2	3:C:359:TRP:CD1	2.52	0.44
3:C:522:TYR:CZ	3:C:526:VAL:HG21	2.52	0.44
2:B:250:LYS:HD3	2:B:256:ASP:HB2	2.00	0.44
2:B:316:GLU:OE1	2:B:372:GLN:HG2	2.18	0.44
2:B:325:ILE:HG22	2:B:331:TRP:NE1	2.33	0.44
3:C:97:TYR:HB2	3:C:430:TYR:HE1	1.82	0.44
4:D:297:GLN:OE1	4:D:297:GLN:O	2.36	0.44
4:D:601:TYR:CD2	4:D:610:PRO:HD3	2.53	0.44
4:D:1164:ASP:HB3	4:D:1167:ASN:ND2	2.33	0.43
1:A:24:G:O3'	4:D:631:ARG:NH2	2.52	0.43
2:B:438:PHE:CD1	2:B:438:PHE:C	2.97	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:10:LEU:HD12	3:C:191:VAL:HG22	2.00	0.43
4:D:567:GLY:HA3	4:D:1087:GLN:O	2.18	0.43
3:C:349:TYR:HB3	3:C:350:PRO:HD2	1.99	0.43
4:D:624:ALA:HB2	4:D:980:ARG:HD2	1.99	0.43
4:D:1088:THR:HG22	4:D:1107:GLY:HA3	1.99	0.43
1:A:30:C:H5''	4:D:944:SER:O	2.18	0.43
3:C:359:TRP:CE3	3:C:453:VAL:HG21	2.52	0.43
4:D:789:LEU:HD21	4:D:862:ARG:HB3	2.00	0.43
3:C:500:GLU:CD	3:C:573:THR:HB	2.43	0.43
4:D:797:GLN:HB3	4:D:803:LEU:HD12	2.00	0.43
2:B:330:ASP:CG	2:B:357:ARG:HH11	2.27	0.43
3:C:458:ASP:O	3:C:606:ASN:ND2	2.52	0.43
4:D:68:GLY:N	4:D:113:ASP:OD1	2.47	0.43
2:B:7:VAL:O	2:B:124:TRP:HA	2.18	0.43
3:C:2:GLN:HG3	3:C:157:THR:O	2.19	0.43
3:C:138:GLU:HG2	3:C:140:PRO:HD3	2.01	0.42
4:D:924:ASP:O	4:D:927:ILE:HG12	2.19	0.42
3:C:60:GLU:OE2	4:D:10:ALA:HA	2.18	0.42
4:D:75:LEU:HD21	4:D:190:PHE:CE2	2.54	0.42
4:D:292:LYS:HA	4:D:299:ALA:HB2	2.01	0.42
3:C:469:LEU:HD23	3:C:603:ILE:HG22	2.01	0.42
3:C:478:PRO:HB3	3:C:538:LEU:HD22	2.01	0.42
3:C:185:PHE:N	3:C:185:PHE:CD2	2.86	0.42
3:C:317:TYR:CE1	3:C:621:CYS:SG	3.12	0.42
4:D:80:GLU:CD	4:D:80:GLU:O	2.62	0.42
2:B:481:LYS:NZ	2:B:556:TRP:O	2.51	0.42
3:C:502:SER:HA	3:C:561:LEU:HD13	2.02	0.42
4:D:999:THR:O	4:D:1181:SER:HA	2.20	0.42
2:B:340:GLU:HB3	2:B:352:VAL:HB	2.00	0.42
2:B:481:LYS:HG2	2:B:556:TRP:CZ2	2.55	0.42
3:C:573:THR:OG1	3:C:576:VAL:HG23	2.20	0.42
4:D:648:LEU:CD2	4:D:844:ASP:HB2	2.50	0.42
3:C:163:ILE:O	3:C:167:ILE:HG12	2.20	0.42
4:D:199:LEU:O	4:D:208:GLY:HA3	2.20	0.42
3:C:285:ARG:HG3	3:C:596:ALA:O	2.20	0.42
4:D:79:PHE:CZ	4:D:186:ALA:HB2	2.55	0.42
4:D:365:THR:O	4:D:365:THR:HG22	2.20	0.42
3:C:521:ARG:O	3:C:525:GLU:HG2	2.20	0.41
4:D:1209:LYS:O	4:D:1211:GLU:OE1	2.37	0.41
2:B:479:LYS:O	2:B:482:GLN:HG2	2.21	0.41
1:A:24:G:OP1	4:D:453:ASN:ND2	2.41	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:245:TYR:CD2	2:B:260:PRO:HG3	2.56	0.41
3:C:312:ASP:O	3:C:313:GLN:HB2	2.20	0.41
4:D:1098:ALA:HB1	4:D:1102:GLU:HB2	2.02	0.41
3:C:204:PRO:CA	3:C:423:THR:HG21	2.48	0.41
3:C:227:CYS:HA	3:C:240:SER:HB2	2.03	0.41
4:D:76:ARG:NH1	4:D:93:PHE:HB3	2.36	0.41
3:C:297:LYS:HA	3:C:450:THR:O	2.20	0.41
4:D:371:PHE:HA	4:D:412:LYS:O	2.20	0.41
4:D:221:LEU:HD11	4:D:239:ALA:O	2.21	0.41
4:D:25:THR:HG22	4:D:210:MET:SD	2.60	0.40
4:D:491:CYS:SG	4:D:548:PRO:HB3	2.61	0.40
4:D:670:LEU:HD11	4:D:842:TYR:CE1	2.55	0.40
4:D:443:GLU:OE1	4:D:1094:ARG:NH2	2.55	0.40
4:D:700:ASN:OD1	4:D:765:PHE:HB3	2.21	0.40
4:D:1017:ASP:OD2	4:D:1020:GLU:HB2	2.22	0.40
1:A:15:U:C5	3:C:118:ASP:OD2	2.71	0.40
2:B:274:PRO:CD	2:B:564:VAL:HG22	2.51	0.40
3:C:519:GLY:HA3	3:C:534:TYR:OH	2.22	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	
2	B	470/592 (79%)	461 (98%)	9 (2%)	0	100	100
3	C	624/635 (98%)	608 (97%)	14 (2%)	2 (0%)	36	60
4	D	1188/1235 (96%)	1162 (98%)	23 (2%)	3 (0%)	36	60
All	All	2282/2462 (93%)	2231 (98%)	46 (2%)	5 (0%)	44	68

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	D	295	GLY
3	C	551	ASP
3	C	610	ASP
4	D	499	ASN
4	D	950	SER

### 5.3.2 Protein sidechains [i](#)

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	
2	B	417/514 (81%)	398 (95%)	19 (5%)	24	51
3	C	533/540 (99%)	519 (97%)	14 (3%)	40	70
4	D	1005/1041 (96%)	979 (97%)	26 (3%)	40	70
All	All	1955/2095 (93%)	1896 (97%)	59 (3%)	37	66

All (59) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	34	GLU
2	B	43	ILE
2	B	194	ILE
2	B	245	TYR
2	B	307	ASP
2	B	328	ASP
2	B	330	ASP
2	B	407	ILE
2	B	433	GLN
2	B	438	PHE
2	B	453	LEU
2	B	468	GLU
2	B	483	MET
2	B	495	GLN
2	B	512	ILE
2	B	525	LYS
2	B	533	THR
2	B	538	LEU

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
2	B	552	LEU
3	C	18	THR
3	C	37	ASP
3	C	46	LEU
3	C	65	ARG
3	C	145	GLU
3	C	158	THR
3	C	213	THR
3	C	322	LEU
3	C	529	LYS
3	C	551	ASP
3	C	608	GLU
3	C	609	MET
3	C	616	LEU
3	C	623	ILE
4	D	7	LYS
4	D	42	ASN
4	D	166	ARG
4	D	175	MET
4	D	182	LEU
4	D	237	ARG
4	D	253	ASP
4	D	296	ASP
4	D	297	GLN
4	D	308	SER
4	D	365	THR
4	D	418	LYS
4	D	705	LEU
4	D	714	VAL
4	D	716	GLN
4	D	745	LYS
4	D	776	ILE
4	D	854	SER
4	D	856	SER
4	D	897	LEU
4	D	950	SER
4	D	953	LEU
4	D	990	GLN
4	D	1088	THR
4	D	1178	ARG
4	D	1221	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (30)

such sidechains are listed below:

Mol	Chain	Res	Type
2	B	197	GLN
2	B	205	ASN
2	B	452	GLN
2	B	469	GLN
2	B	524	GLN
3	C	19	GLN
3	C	40	HIS
3	C	92	ASN
3	C	139	ASN
3	C	288	HIS
3	C	313	GLN
3	C	391	GLN
3	C	531	HIS
4	D	134	ASN
4	D	158	ASN
4	D	325	GLN
4	D	517	HIS
4	D	565	HIS
4	D	747	HIS
4	D	773	GLN
4	D	808	ASN
4	D	880	GLN
4	D	962	HIS
4	D	976	GLN
4	D	1010	HIS
4	D	1044	ASN
4	D	1105	HIS
4	D	1218	GLN
4	D	1227	ASN
4	D	1232	ASN

### 5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	A	38/43 (88%)	14 (36%)	6 (15%)
5	E	36/47 (76%)	8 (22%)	0
All	All	74/90 (82%)	22 (29%)	6 (8%)

All (22) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	A	3	U
1	A	6	A
1	A	7	A
1	A	8	C
1	A	11	G
1	A	14	U
1	A	19	C
1	A	20	A
1	A	22	G
1	A	30	C
1	A	31	U
1	A	36	U
1	A	37	U
1	A	38	U
5	E	3	A
5	E	12	G
5	E	16	A
5	E	18	C
5	E	22	G
5	E	27	A
5	E	28	G
5	E	34	U

All (6) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	A	7	A
1	A	9	U
1	A	13	C
1	A	19	C
1	A	25	U
1	A	27	A

#### 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

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
8	SAM	C	702	-	27,29,29	0.45	0	36,42,42	0.45	0
7	ANP	B	602	6	32,33,33	1.06	3 (9%)	44,52,52	0.96	2 (4%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
8	SAM	C	702	-	-	2/16/33/33	0/3/3/3
7	ANP	B	602	6	-	4/18/38/38	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	B	602	ANP	PG-O1G	3.30	1.51	1.46
7	B	602	ANP	PB-O1B	2.81	1.50	1.46
7	B	602	ANP	PB-O2B	-2.20	1.50	1.56

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	B	602	ANP	O2B-PB-O1B	4.09	118.50	109.92
7	B	602	ANP	O3A-PB-N3B	-2.13	100.69	106.59

There are no chirality outliers.

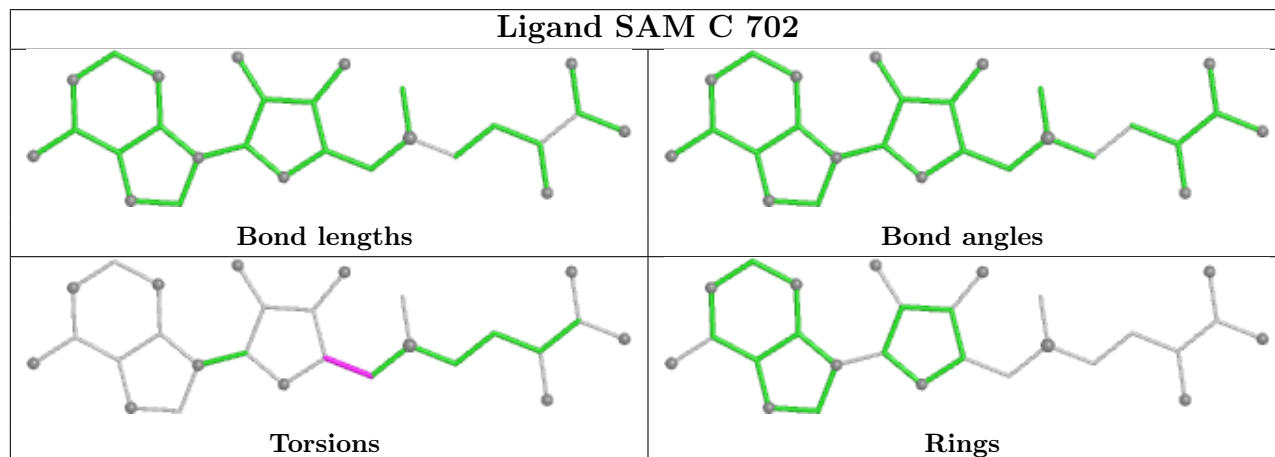
All (6) torsion outliers are listed below:

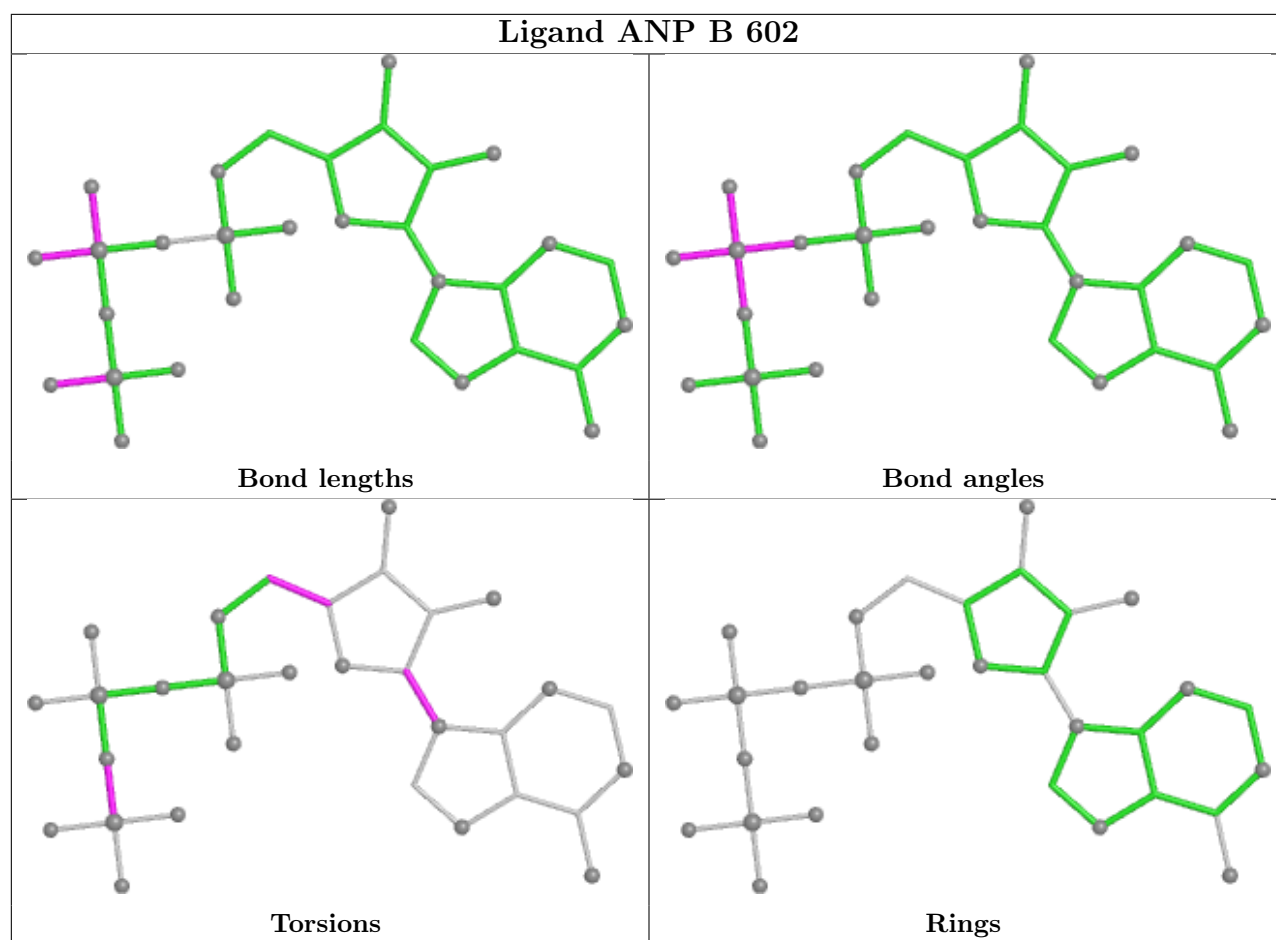
Mol	Chain	Res	Type	Atoms
7	B	602	ANP	PB-N3B-PG-O1G
8	C	702	SAM	C3'-C4'-C5'-SD
7	B	602	ANP	O4'-C4'-C5'-O5'
7	B	602	ANP	C3'-C4'-C5'-O5'
8	C	702	SAM	O4'-C4'-C5'-SD
7	B	602	ANP	C2'-C1'-N9-C8

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.

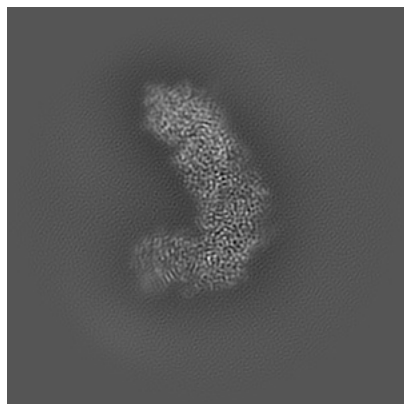
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-66348. These allow visual inspection of the internal detail of the map and identification of artifacts.

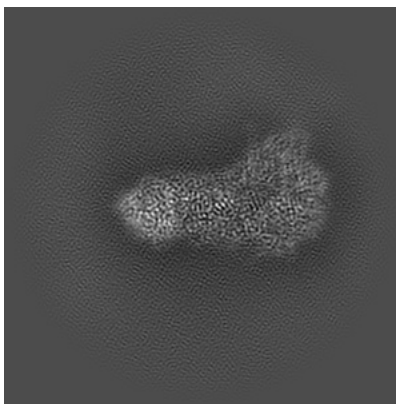
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

### 6.1 Orthogonal projections [i](#)

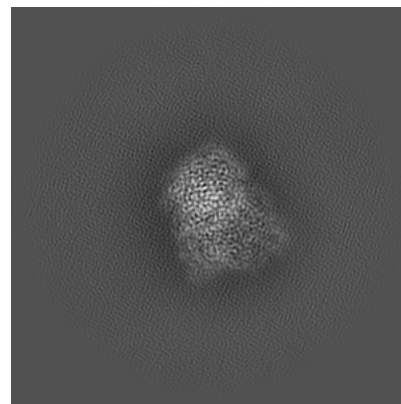
#### 6.1.1 Primary map



X

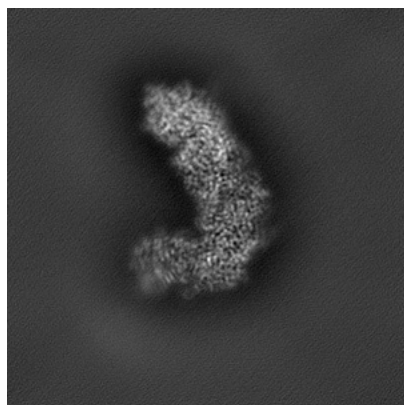


Y

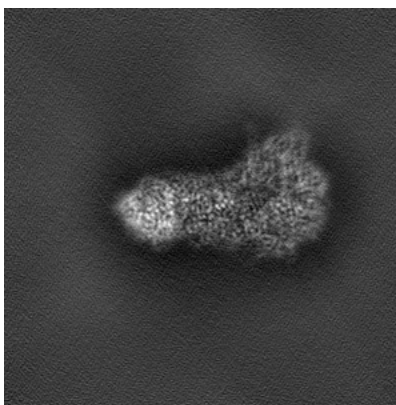


Z

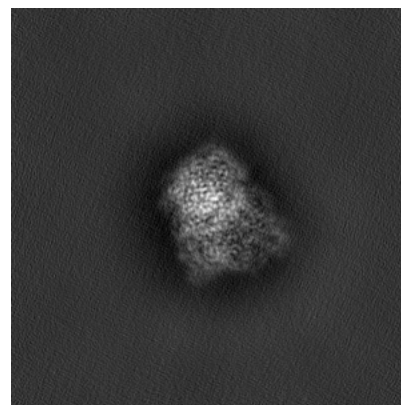
#### 6.1.2 Raw map



X



Y

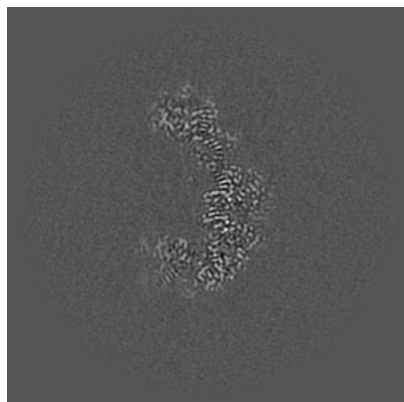


Z

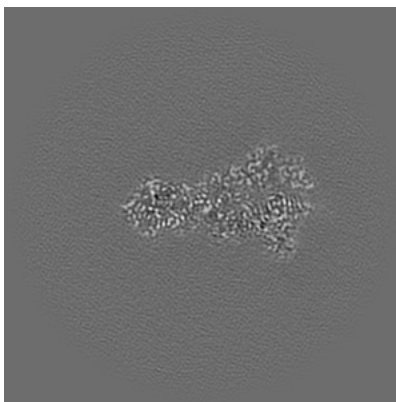
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

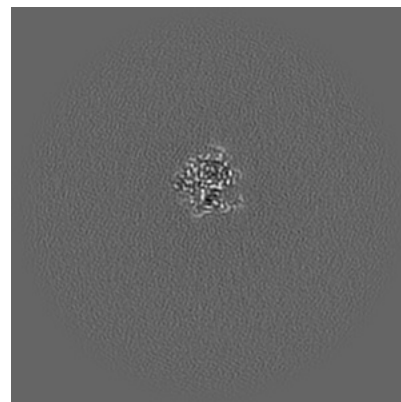
### 6.2.1 Primary map



X Index: 150

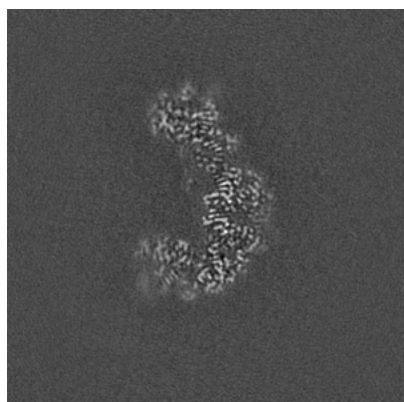


Y Index: 150

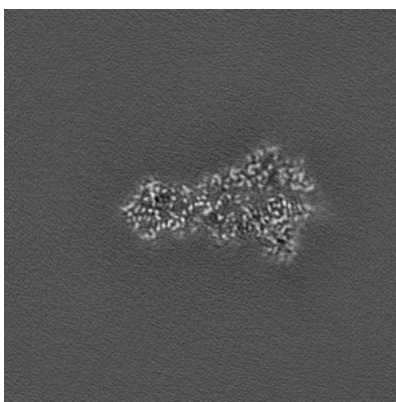


Z Index: 150

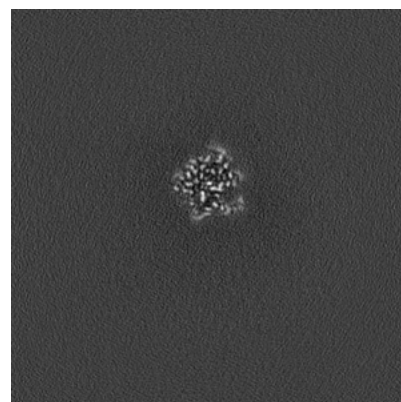
### 6.2.2 Raw map



X Index: 150



Y Index: 150

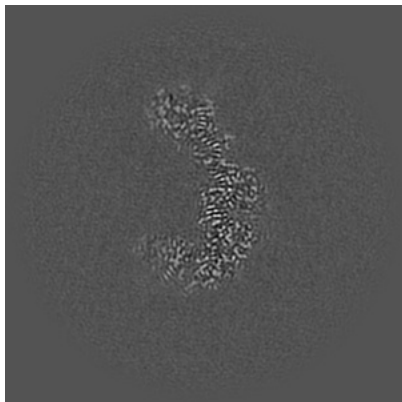


Z Index: 150

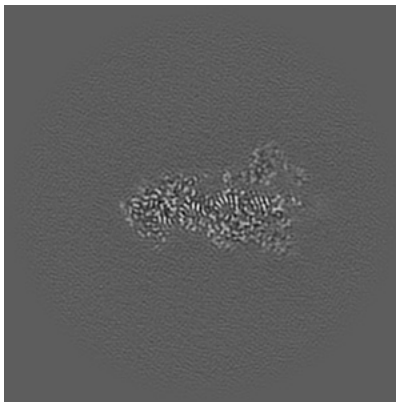
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices [i](#)

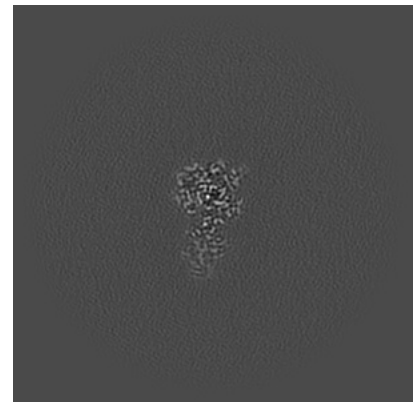
### 6.3.1 Primary map



X Index: 149

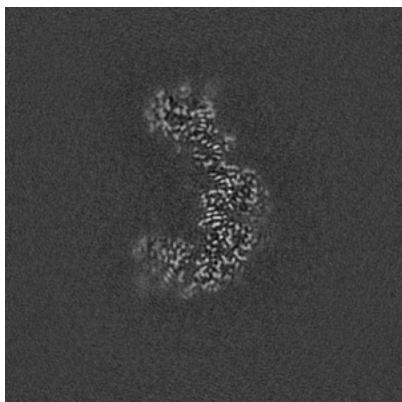


Y Index: 157

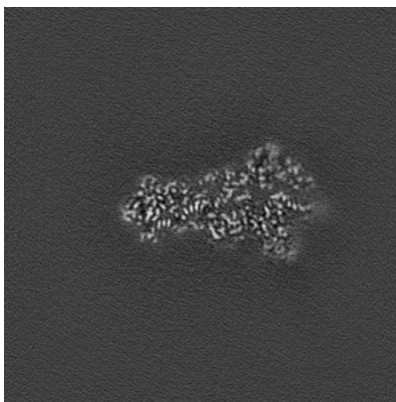


Z Index: 112

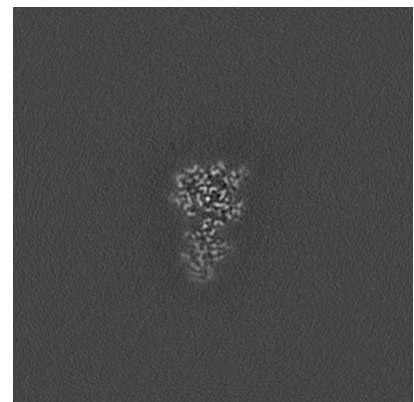
### 6.3.2 Raw map



X Index: 149



Y Index: 152

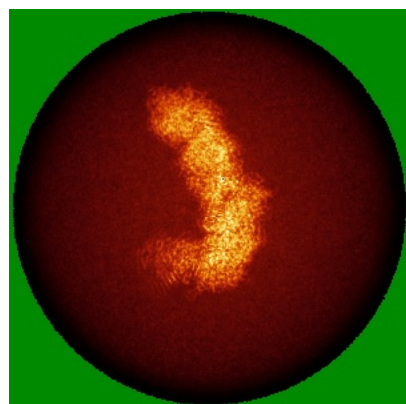


Z Index: 112

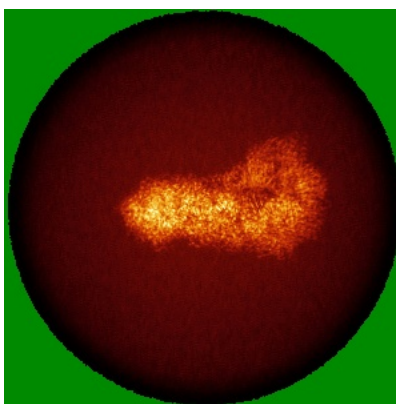
The images above show the largest variance slices of the map in three orthogonal directions.

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

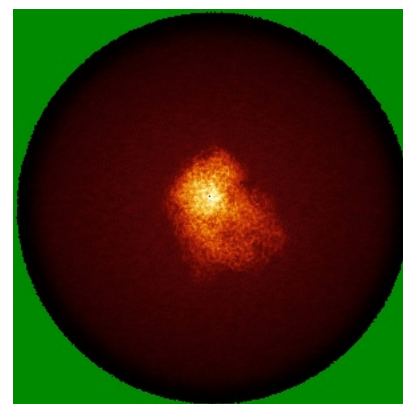
### 6.4.1 Primary map



X

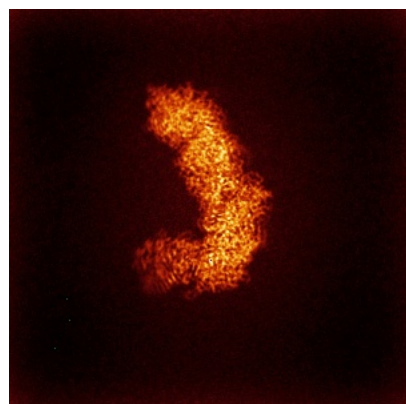


Y

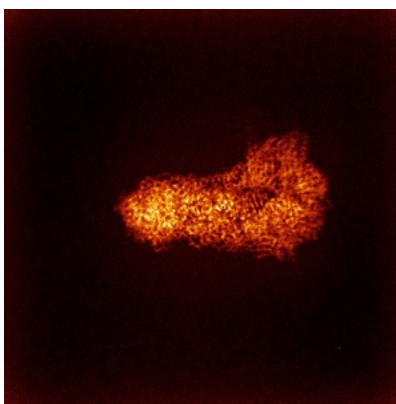


Z

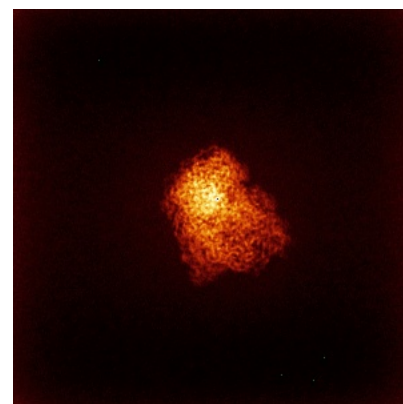
### 6.4.2 Raw map



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



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.126. 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



X



Y



Z

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.

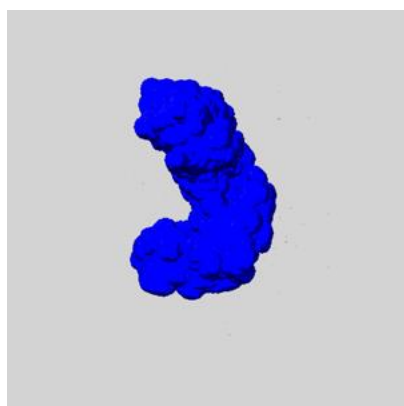
## 6.6 Mask visualisation [i](#)

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

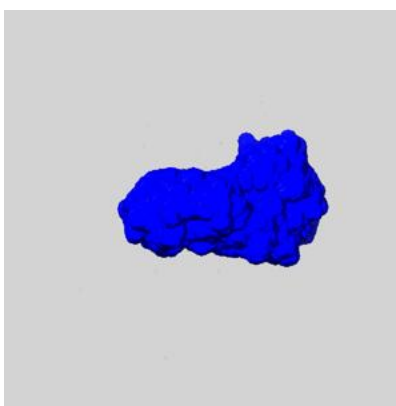
A mask typically either:

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

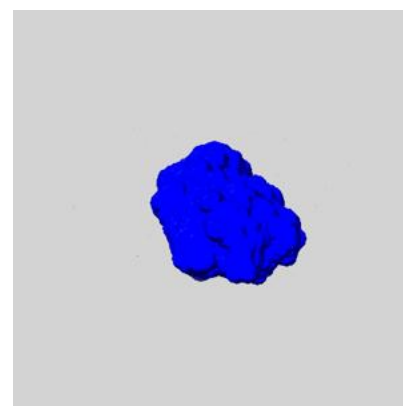
### 6.6.1 emd\_66348\_msk\_1.map [i](#)



X



Y

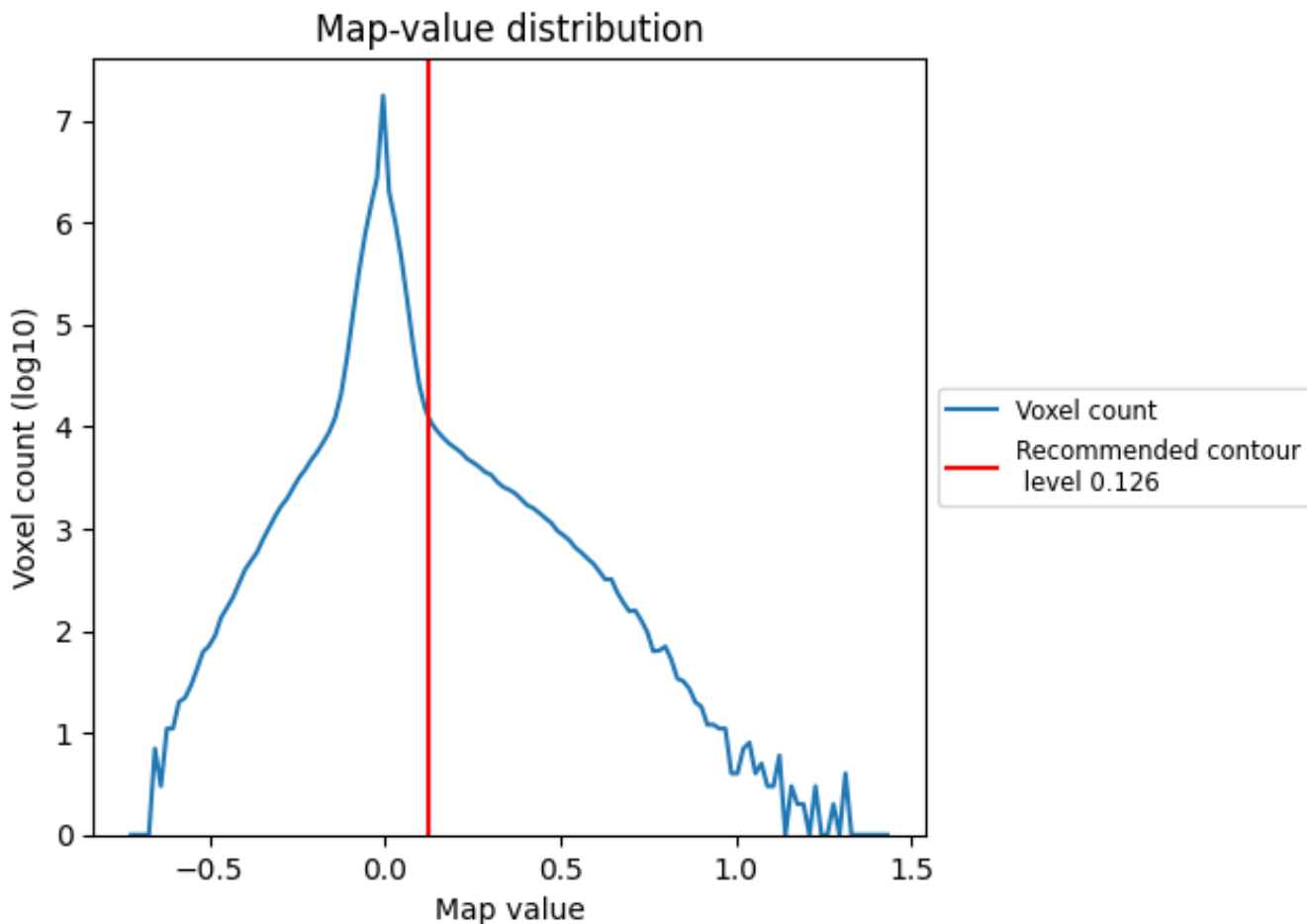


Z

## 7 Map analysis [i](#)

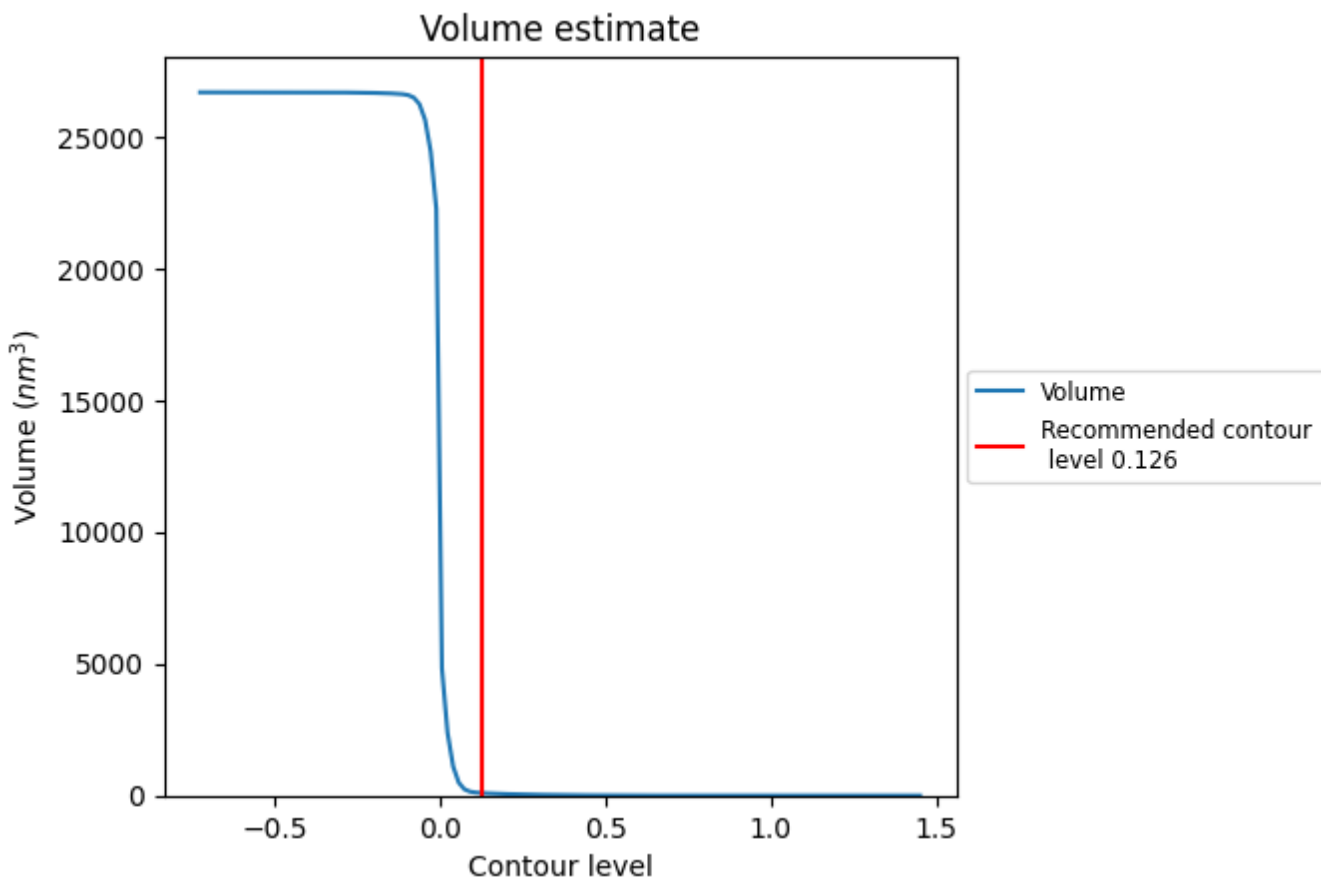
This section contains the results of statistical analysis of the map.

### 7.1 Map-value distribution [i](#)



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

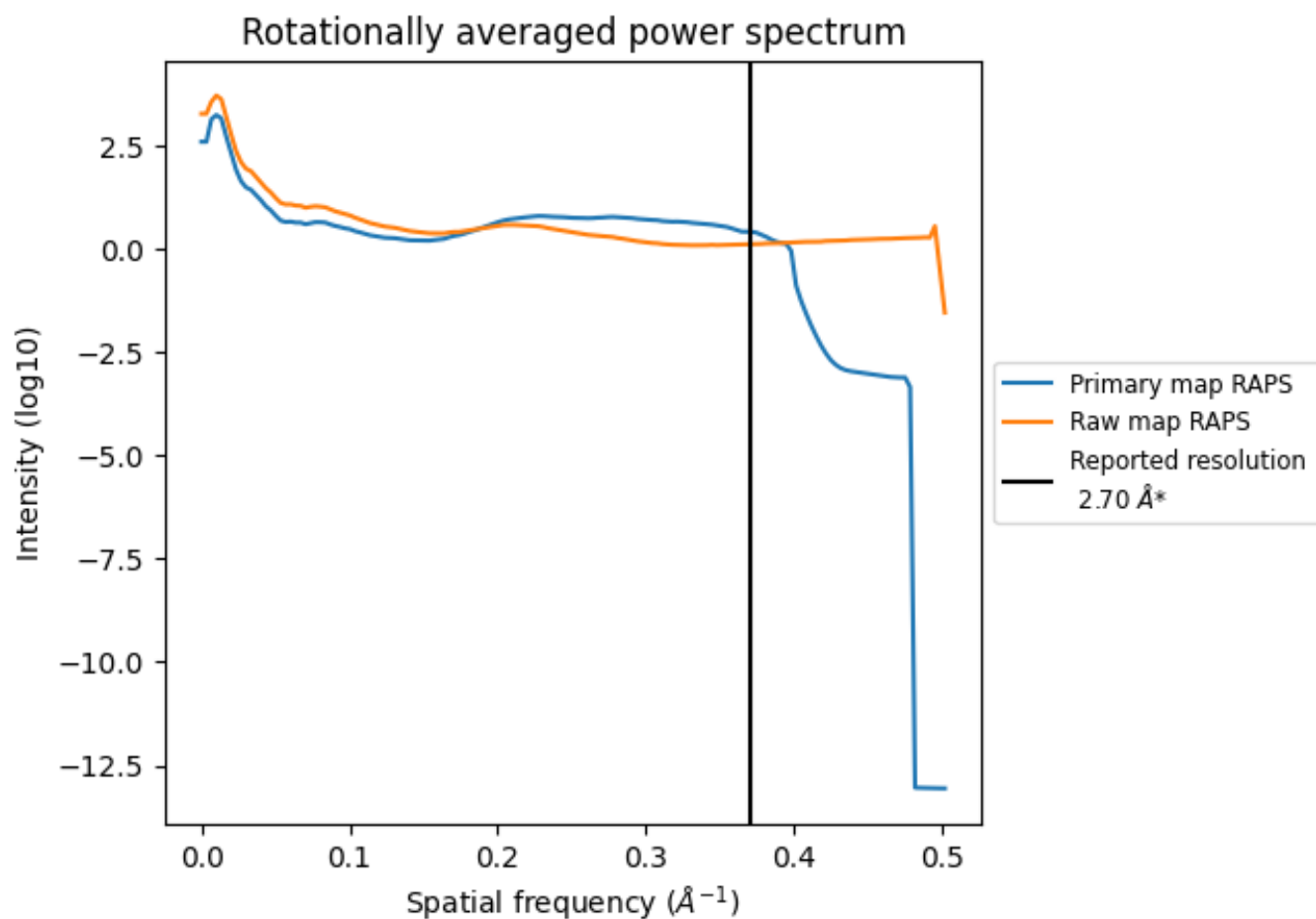
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 97  $\text{nm}^3$ ; this corresponds to an approximate mass of 87 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 [i](#)

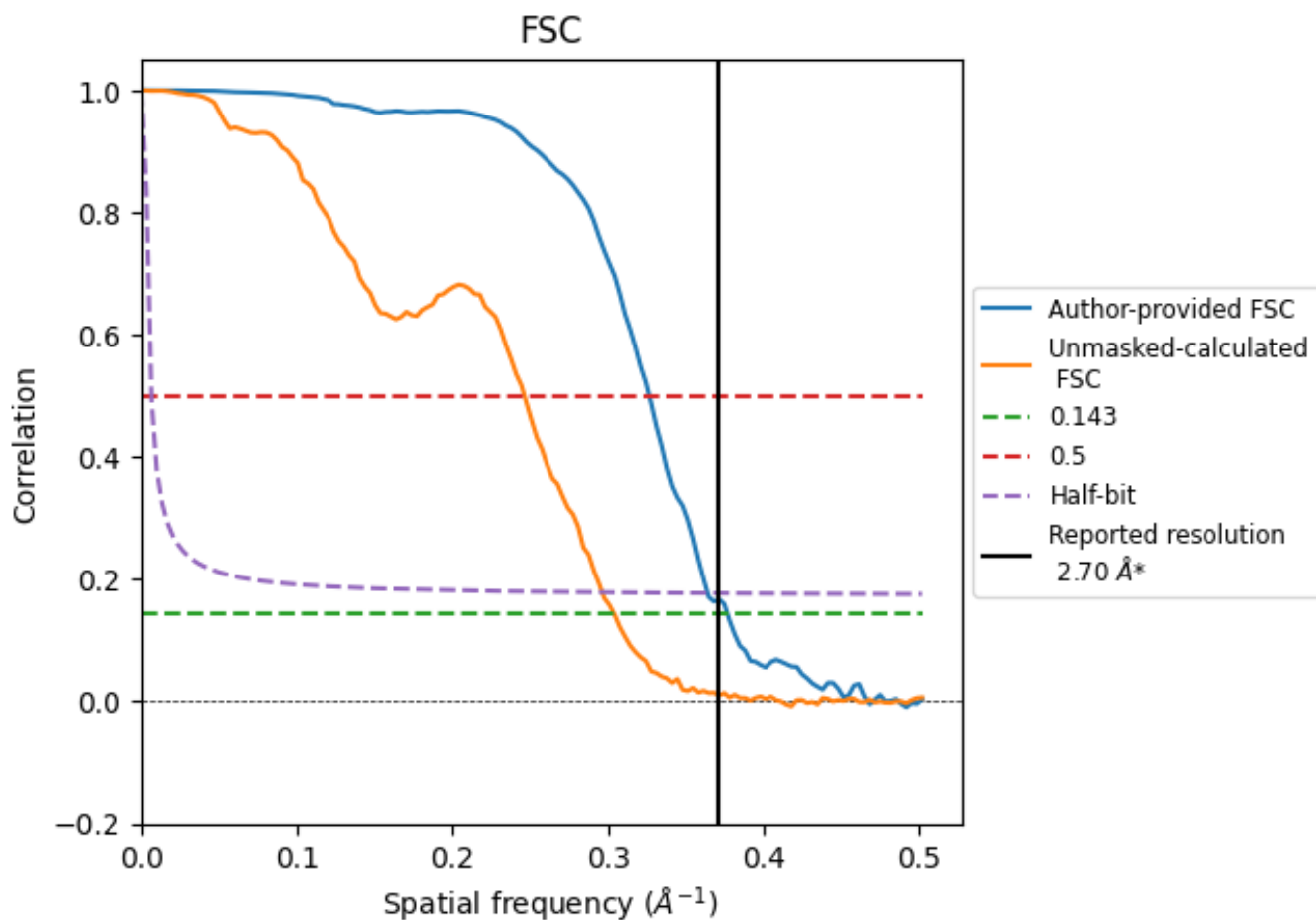


\*Reported resolution corresponds to spatial frequency of  $0.370 \text{\AA}^{-1}$

## 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 0.370 Å<sup>-1</sup>

## 8.2 Resolution estimates [i](#)

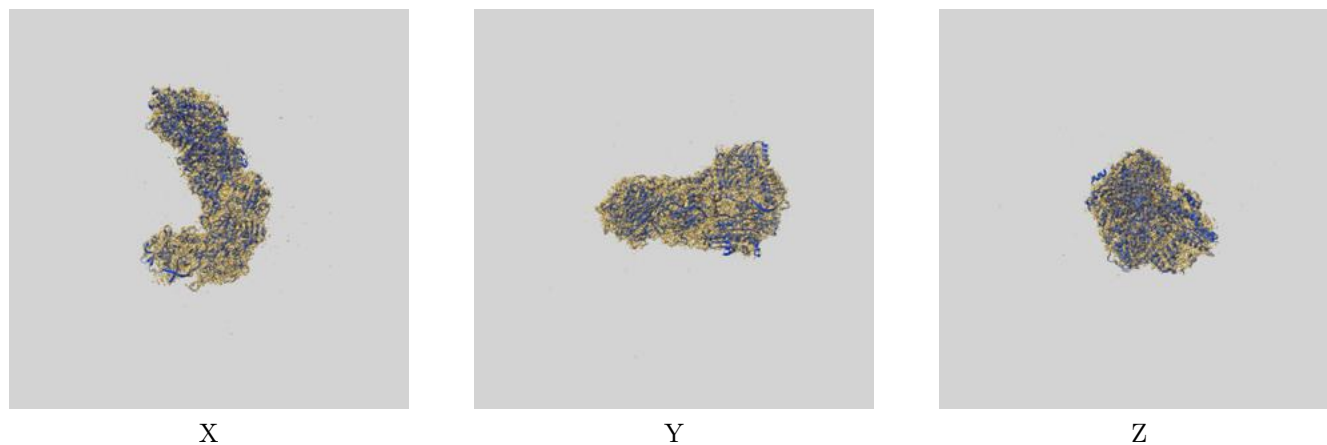
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.70	-	-
Author-provided FSC curve	2.65	3.06	2.75
Unmasked-calculated*	3.29	4.06	3.37

\*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 3.29 differs from the reported value 2.7 by more than 10 %

## 9 Map-model fit [i](#)

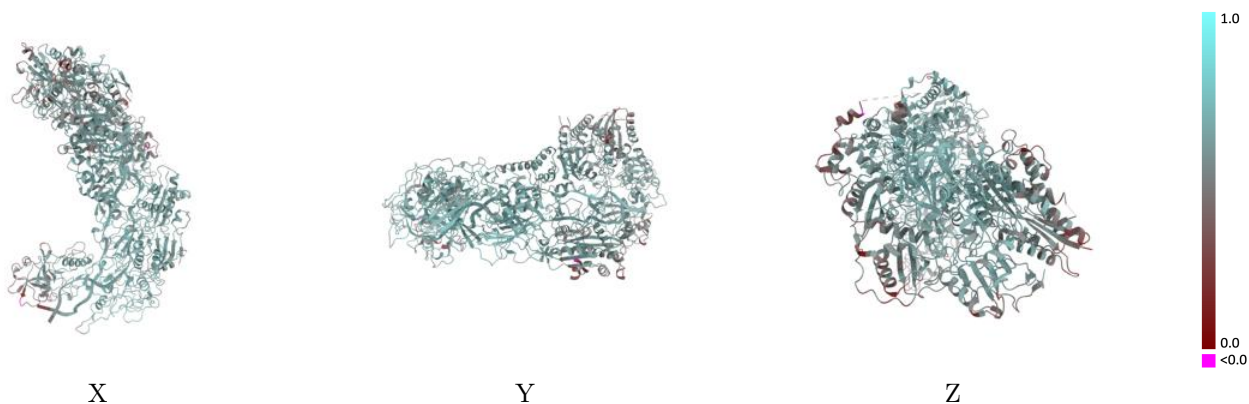
This section contains information regarding the fit between EMDB map EMD-66348 and PDB model 9WXJ. Per-residue inclusion information can be found in section [3](#) on page [8](#).

### 9.1 Map-model overlay [i](#)



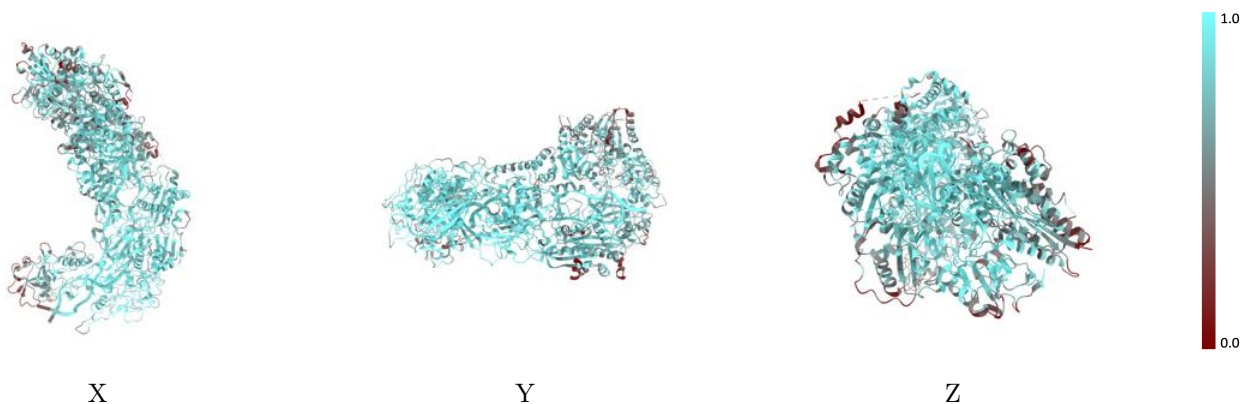
The images above show the 3D surface view of the map at the recommended contour level 0.126 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



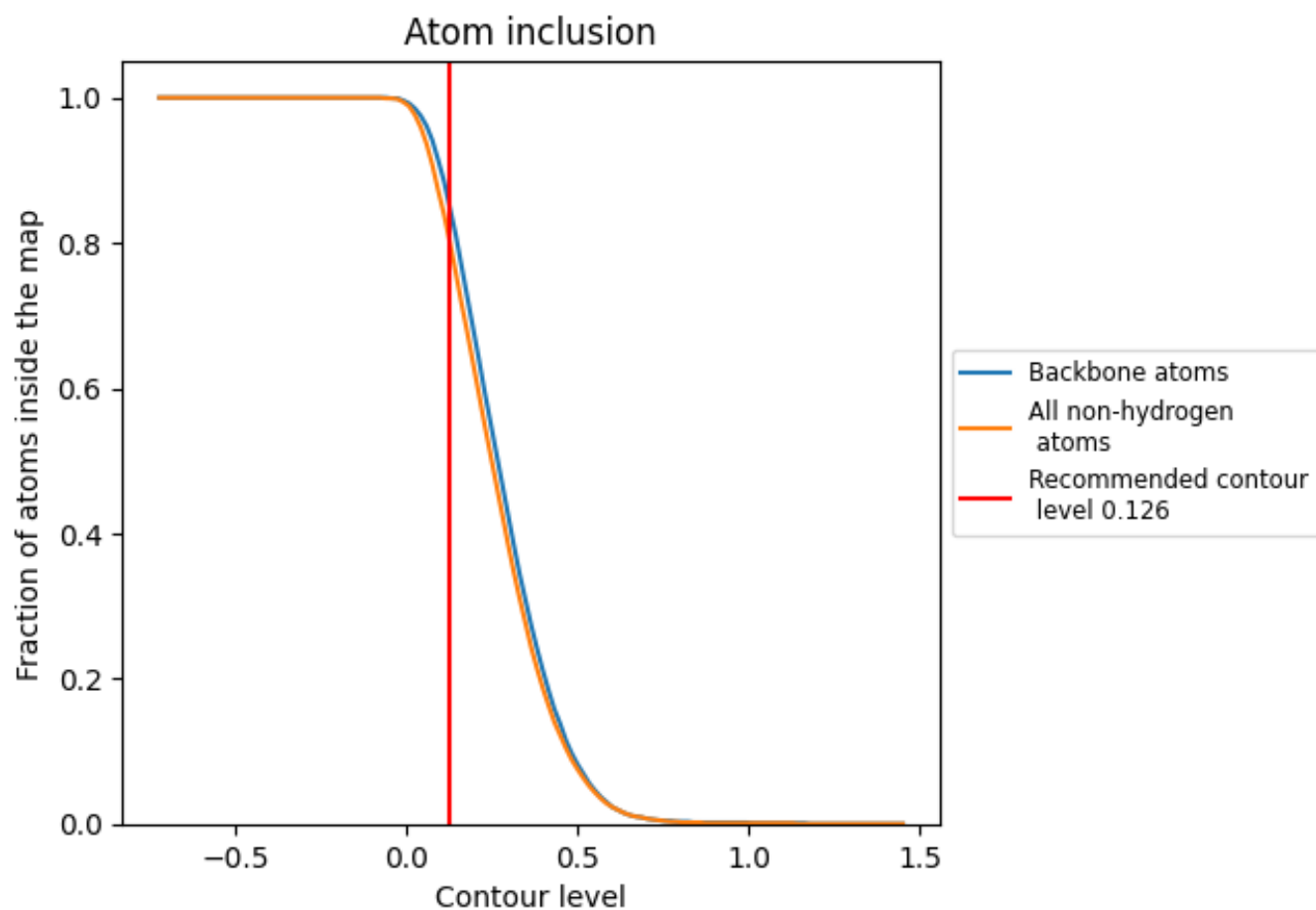
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.126).













## 9.4 Atom inclusion [i](#)



At the recommended contour level, 85% 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 (0.126) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8000	 0.5900
A	 0.9720	 0.6520
B	 0.7390	 0.5610
C	 0.7860	 0.5760
D	 0.8090	 0.6000
E	 0.9580	 0.6400

