



Full wwPDB EM Validation Report ⓘ

Sep 23, 2026 – 12:21 PM EDT

PDB ID : 11ST / pdb_000011st
EMDB ID : EMD-76021
Title : Structure of Yarrowia lipolytica ORC-Cdc6 bound to 54bp segment of OriC-061 DNA
Authors : Bauer, J.; Joshua-Tor, L.
Deposited on : 2026-03-11
Resolution : 2.73 Å(reported)
Based on initial model : .

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:

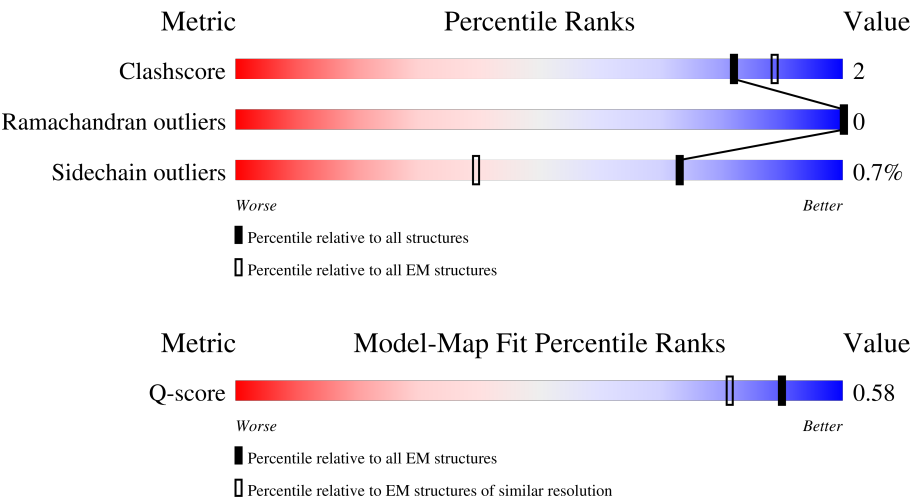
EMDB validation analysis : 0.0.1.dev133
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data 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) : 2.50

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 2.73 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.



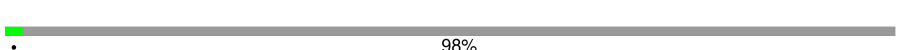
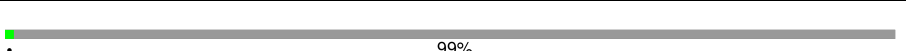
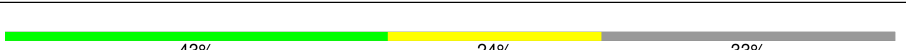
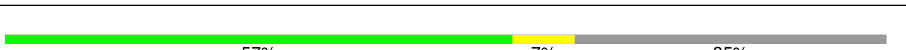
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	10432 (2.23 - 3.23)

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	861	
2	B	509	
3	C	685	
4	D	511	

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Mol	Chain	Length	Quality of chain
5	E	465	
6	F	365	
7	G	605	
7	K	605	
7	L	605	
8	X	54	
9	Y	54	

2 Entry composition

There are 13 unique types of molecules in this entry. The entry contains 25039 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 Origin recognition complex subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	416	Total	C	N	O	S	0	0
			3246	2044	570	620	12		

There are 143 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-142	MET	-	initiating methionine	UNP Q6C9L7
A	-141	SER	-	expression tag	UNP Q6C9L7
A	-140	ALA	-	expression tag	UNP Q6C9L7
A	-139	TRP	-	expression tag	UNP Q6C9L7
A	-138	SER	-	expression tag	UNP Q6C9L7
A	-137	HIS	-	expression tag	UNP Q6C9L7
A	-136	PRO	-	expression tag	UNP Q6C9L7
A	-135	GLN	-	expression tag	UNP Q6C9L7
A	-134	PHE	-	expression tag	UNP Q6C9L7
A	-133	GLU	-	expression tag	UNP Q6C9L7
A	-132	LYS	-	expression tag	UNP Q6C9L7
A	-131	GLY	-	expression tag	UNP Q6C9L7
A	-130	GLY	-	expression tag	UNP Q6C9L7
A	-129	GLY	-	expression tag	UNP Q6C9L7
A	-128	SER	-	expression tag	UNP Q6C9L7
A	-127	GLY	-	expression tag	UNP Q6C9L7
A	-126	GLY	-	expression tag	UNP Q6C9L7
A	-125	GLY	-	expression tag	UNP Q6C9L7
A	-124	SER	-	expression tag	UNP Q6C9L7
A	-123	GLY	-	expression tag	UNP Q6C9L7
A	-122	GLY	-	expression tag	UNP Q6C9L7
A	-121	SER	-	expression tag	UNP Q6C9L7
A	-120	ALA	-	expression tag	UNP Q6C9L7
A	-119	TRP	-	expression tag	UNP Q6C9L7
A	-118	SER	-	expression tag	UNP Q6C9L7
A	-117	HIS	-	expression tag	UNP Q6C9L7
A	-116	PRO	-	expression tag	UNP Q6C9L7
A	-115	GLN	-	expression tag	UNP Q6C9L7

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-114	PHE	-	expression tag	UNP Q6C9L7
A	-113	GLU	-	expression tag	UNP Q6C9L7
A	-112	LYS	-	expression tag	UNP Q6C9L7
A	-111	THR	-	expression tag	UNP Q6C9L7
A	-110	GLY	-	expression tag	UNP Q6C9L7
A	-109	SER	-	expression tag	UNP Q6C9L7
A	-108	LEU	-	expression tag	UNP Q6C9L7
A	-107	GLN	-	expression tag	UNP Q6C9L7
A	-106	ASP	-	expression tag	UNP Q6C9L7
A	-105	SER	-	expression tag	UNP Q6C9L7
A	-104	GLU	-	expression tag	UNP Q6C9L7
A	-103	VAL	-	expression tag	UNP Q6C9L7
A	-102	ASN	-	expression tag	UNP Q6C9L7
A	-101	GLN	-	expression tag	UNP Q6C9L7
A	-100	GLU	-	expression tag	UNP Q6C9L7
A	-99	ALA	-	expression tag	UNP Q6C9L7
A	-98	LYS	-	expression tag	UNP Q6C9L7
A	-97	PRO	-	expression tag	UNP Q6C9L7
A	-96	GLU	-	expression tag	UNP Q6C9L7
A	-95	VAL	-	expression tag	UNP Q6C9L7
A	-94	LYS	-	expression tag	UNP Q6C9L7
A	-93	PRO	-	expression tag	UNP Q6C9L7
A	-92	GLU	-	expression tag	UNP Q6C9L7
A	-91	VAL	-	expression tag	UNP Q6C9L7
A	-90	LYS	-	expression tag	UNP Q6C9L7
A	-89	PRO	-	expression tag	UNP Q6C9L7
A	-88	GLU	-	expression tag	UNP Q6C9L7
A	-87	THR	-	expression tag	UNP Q6C9L7
A	-86	HIS	-	expression tag	UNP Q6C9L7
A	-85	ILE	-	expression tag	UNP Q6C9L7
A	-84	ASN	-	expression tag	UNP Q6C9L7
A	-83	LEU	-	expression tag	UNP Q6C9L7
A	-82	LYS	-	expression tag	UNP Q6C9L7
A	-81	VAL	-	expression tag	UNP Q6C9L7
A	-80	SER	-	expression tag	UNP Q6C9L7
A	-79	ASP	-	expression tag	UNP Q6C9L7
A	-78	GLY	-	expression tag	UNP Q6C9L7
A	-77	SER	-	expression tag	UNP Q6C9L7
A	-76	SER	-	expression tag	UNP Q6C9L7
A	-75	GLU	-	expression tag	UNP Q6C9L7
A	-74	ILE	-	expression tag	UNP Q6C9L7
A	-73	PHE	-	expression tag	UNP Q6C9L7

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-72	PHE	-	expression tag	UNP Q6C9L7
A	-71	LYS	-	expression tag	UNP Q6C9L7
A	-70	ILE	-	expression tag	UNP Q6C9L7
A	-69	LYS	-	expression tag	UNP Q6C9L7
A	-68	LYS	-	expression tag	UNP Q6C9L7
A	-67	THR	-	expression tag	UNP Q6C9L7
A	-66	THR	-	expression tag	UNP Q6C9L7
A	-65	PRO	-	expression tag	UNP Q6C9L7
A	-64	LEU	-	expression tag	UNP Q6C9L7
A	-63	ARG	-	expression tag	UNP Q6C9L7
A	-62	ARG	-	expression tag	UNP Q6C9L7
A	-61	LEU	-	expression tag	UNP Q6C9L7
A	-60	MET	-	expression tag	UNP Q6C9L7
A	-59	GLU	-	expression tag	UNP Q6C9L7
A	-58	ALA	-	expression tag	UNP Q6C9L7
A	-57	PHE	-	expression tag	UNP Q6C9L7
A	-56	ALA	-	expression tag	UNP Q6C9L7
A	-55	LYS	-	expression tag	UNP Q6C9L7
A	-54	ARG	-	expression tag	UNP Q6C9L7
A	-53	GLN	-	expression tag	UNP Q6C9L7
A	-52	GLY	-	expression tag	UNP Q6C9L7
A	-51	LYS	-	expression tag	UNP Q6C9L7
A	-50	GLU	-	expression tag	UNP Q6C9L7
A	-49	MET	-	expression tag	UNP Q6C9L7
A	-48	ASP	-	expression tag	UNP Q6C9L7
A	-47	SER	-	expression tag	UNP Q6C9L7
A	-46	LEU	-	expression tag	UNP Q6C9L7
A	-45	THR	-	expression tag	UNP Q6C9L7
A	-44	PHE	-	expression tag	UNP Q6C9L7
A	-43	LEU	-	expression tag	UNP Q6C9L7
A	-42	TYR	-	expression tag	UNP Q6C9L7
A	-41	ASP	-	expression tag	UNP Q6C9L7
A	-40	GLY	-	expression tag	UNP Q6C9L7
A	-39	ILE	-	expression tag	UNP Q6C9L7
A	-38	GLU	-	expression tag	UNP Q6C9L7
A	-37	ILE	-	expression tag	UNP Q6C9L7
A	-36	GLN	-	expression tag	UNP Q6C9L7
A	-35	ALA	-	expression tag	UNP Q6C9L7
A	-34	ASP	-	expression tag	UNP Q6C9L7
A	-33	GLN	-	expression tag	UNP Q6C9L7
A	-32	THR	-	expression tag	UNP Q6C9L7
A	-31	PRO	-	expression tag	UNP Q6C9L7

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-30	GLU	-	expression tag	UNP Q6C9L7
A	-29	ASP	-	expression tag	UNP Q6C9L7
A	-28	LEU	-	expression tag	UNP Q6C9L7
A	-27	ASP	-	expression tag	UNP Q6C9L7
A	-26	MET	-	expression tag	UNP Q6C9L7
A	-25	GLU	-	expression tag	UNP Q6C9L7
A	-24	ASP	-	expression tag	UNP Q6C9L7
A	-23	ASN	-	expression tag	UNP Q6C9L7
A	-22	ASP	-	expression tag	UNP Q6C9L7
A	-21	ILE	-	expression tag	UNP Q6C9L7
A	-20	ILE	-	expression tag	UNP Q6C9L7
A	-19	GLU	-	expression tag	UNP Q6C9L7
A	-18	ALA	-	expression tag	UNP Q6C9L7
A	-17	HIS	-	expression tag	UNP Q6C9L7
A	-16	ARG	-	expression tag	UNP Q6C9L7
A	-15	GLU	-	expression tag	UNP Q6C9L7
A	-14	GLN	-	expression tag	UNP Q6C9L7
A	-13	ILE	-	expression tag	UNP Q6C9L7
A	-12	GLY	-	expression tag	UNP Q6C9L7
A	-11	GLY	-	expression tag	UNP Q6C9L7
A	-10	ILE	-	expression tag	UNP Q6C9L7
A	-9	PRO	-	expression tag	UNP Q6C9L7
A	-8	THR	-	expression tag	UNP Q6C9L7
A	-7	THR	-	expression tag	UNP Q6C9L7
A	-6	GLU	-	expression tag	UNP Q6C9L7
A	-5	ASN	-	expression tag	UNP Q6C9L7
A	-4	LEU	-	expression tag	UNP Q6C9L7
A	-3	TYR	-	expression tag	UNP Q6C9L7
A	-2	PHE	-	expression tag	UNP Q6C9L7
A	-1	GLN	-	expression tag	UNP Q6C9L7
A	0	GLY	-	expression tag	UNP Q6C9L7

- Molecule 2 is a protein called Origin recognition complex subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	377	Total	C	N	O	S	0	0
			2997	1919	497	568	13		

- Molecule 3 is a protein called Origin recognition complex subunit 3 (Orc3).

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	630	Total	C	N	O	S	0	0
			5118	3267	857	976	18		

- Molecule 4 is a protein called Origin recognition complex subunit 4 (Orc4).

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	445	Total	C	N	O	S	0	0
			3584	2267	622	682	13		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	18	GLU	LYS	conflict	UNP Q6C5R0

- Molecule 5 is a protein called Origin recognition complex subunit 5 (Orc5).

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	441	Total	C	N	O	S	0	0
			3518	2234	614	656	14		

- Molecule 6 is a protein called Origin recognition complex subunit 6 (Orc6).

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	162	Total	C	N	O	S	0	0
			1353	869	243	235	6		

- Molecule 7 is a protein called Cell division control protein 6 (Cdc6).

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	441	Total	C	N	O	S	0	0
			3435	2176	608	629	22		
7	K	14	Total	C	N	O	S	0	0
			106	66	23	16	1		
7	L	9	Total	C	N	O		0	0
			82	50	21	11			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
G	0	GLY	-	expression tag	UNP Q6CDG7
K	0	GLY	-	expression tag	UNP Q6CDG7
L	0	GLY	-	expression tag	UNP Q6CDG7

- Molecule 8 is a DNA chain called DNA (54-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
8	X	36	Total	C	N	O	P	0	0
			733	350	136	211	36		

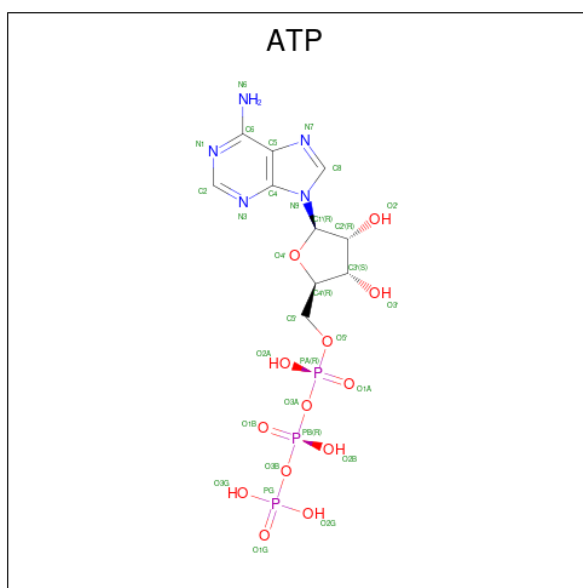
- Molecule 9 is a DNA chain called DNA (54-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
9	Y	35	Total	C	N	O	P	0	0
			722	345	126	216	35		

- Molecule 10 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
10	A	1	Total	Mg	0
			1	1	
10	D	1	Total	Mg	0
			1	1	
10	G	1	Total	Mg	0
			1	1	

- Molecule 11 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: C₁₀H₁₆N₅O₁₃P₃).



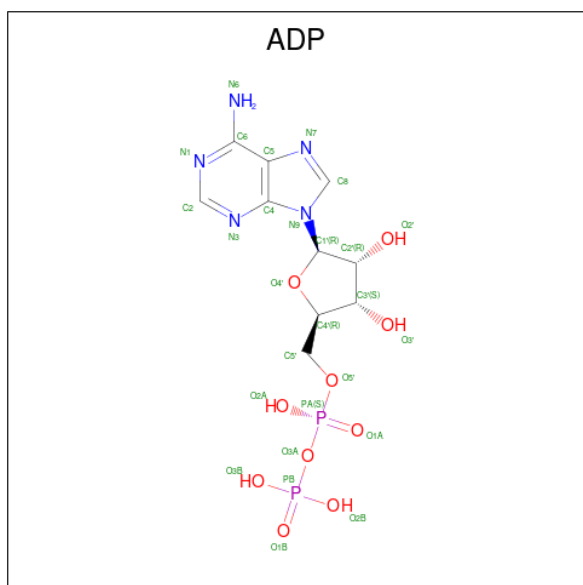
Mol	Chain	Residues	Atoms					AltConf
11	A	1	Total	C	N	O	P	0
			31	10	5	13	3	

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

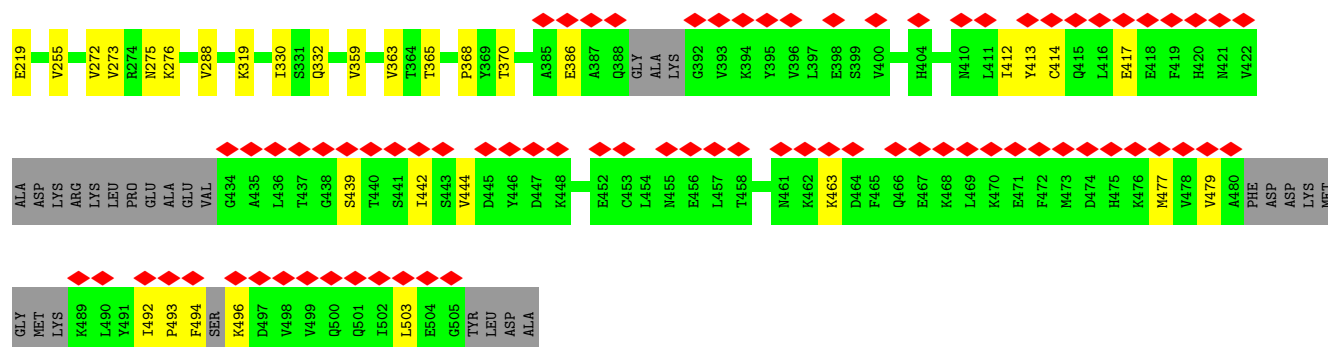
- Molecule 12 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$).



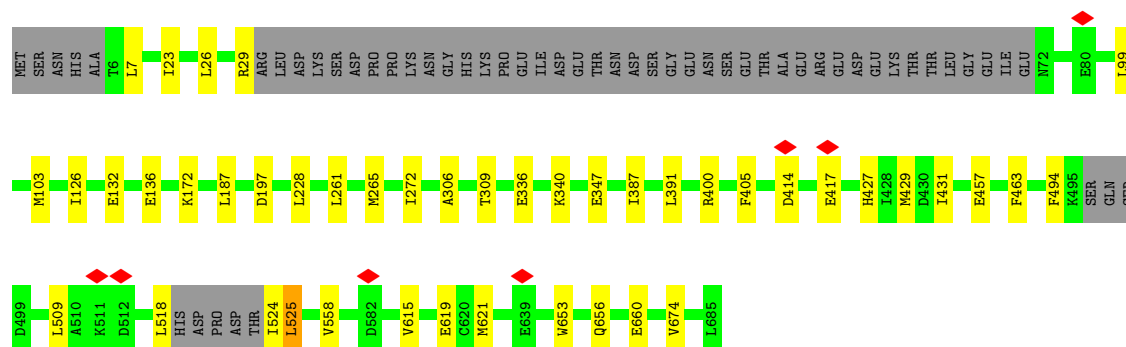
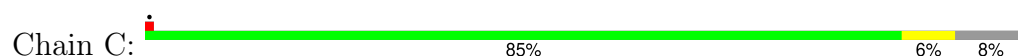
Mol	Chain	Residues	Atoms					AltConf
12	E	1	Total	C	N	O	P	0
			27	10	5	10	2	

- Molecule 13 is water.

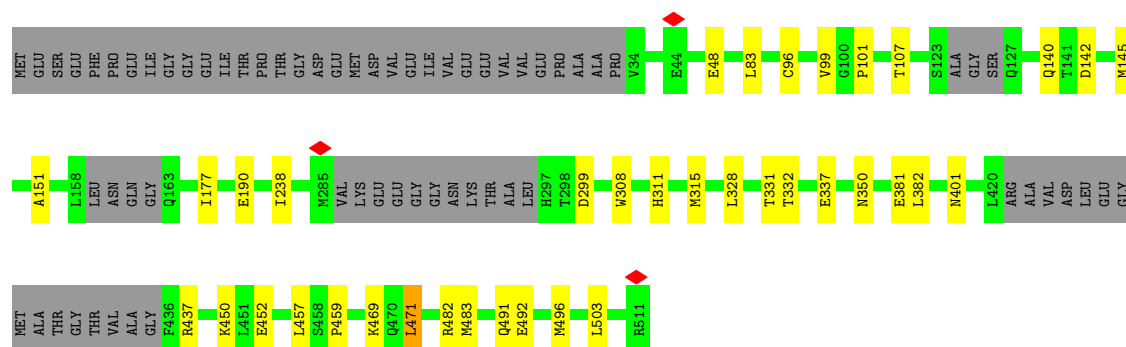
Mol	Chain	Residues	Atoms		AltConf
13	A	1	Total	O	0
			1	1	
13	B	1	Total	O	0
			1	1	
13	C	3	Total	O	0
			3	3	
13	G	1	Total	O	0
			1	1	
13	X	8	Total	O	0
			8	8	
13	Y	8	Total	O	0
			8	8	



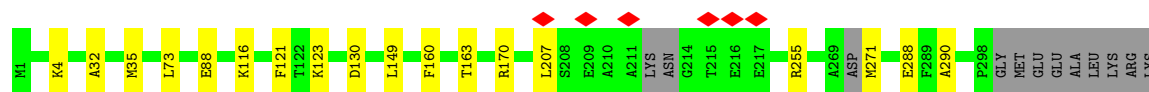
• Molecule 3: Origin recognition complex subunit 3 (Orc3)

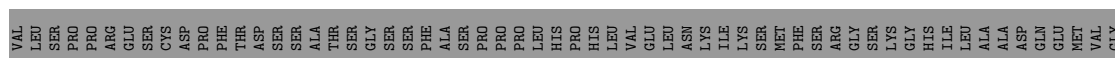


• Molecule 4: Origin recognition complex subunit 4 (Orc4)



• Molecule 5: Origin recognition complex subunit 5 (Orc5)





[illegible]

- Molecule 7: Cell division control protein 6 (Cdc6)

Chain L: 

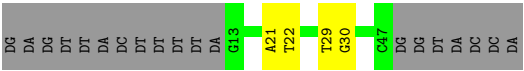
99%

[illegible]

- Molecule 8: DNA (54-MER)



● Molecule 9: DNA (54-MER)



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	51599	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION; CTF correction was done first in WARP during exposure/micrograph pre-processing, and re-corrected during the final refinements/reconstruction of the map in cryoSPARC	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	43.2	Depositor
Minimum defocus (nm)	600	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	105000	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.814	Depositor
Minimum map value	-0.280	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.019	Depositor
Recommended contour level	0.15	Depositor
Map size ($\text{\AA}$)	382.36002, 382.36002, 382.36002	wwPDB
Map dimensions	440, 440, 440	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	0.869, 0.869, 0.869	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: MG, ATP, ADP

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	0.11	0/3296	0.24	0/4455
2	B	0.11	0/3057	0.25	0/4131
3	C	0.12	0/5224	0.25	0/7063
4	D	0.12	0/3645	0.26	0/4931
5	E	0.12	0/3584	0.25	0/4854
6	F	0.10	0/1387	0.24	0/1865
7	G	0.10	0/3482	0.25	0/4674
7	K	0.10	0/107	0.30	0/142
7	L	0.07	0/82	0.21	0/108
8	X	0.21	0/822	0.42	0/1264
9	Y	0.24	0/808	0.42	0/1247
All	All	0.13	0/25494	0.26	0/34734

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	3246	0	3305	9	0
2	B	2997	0	2956	22	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	5118	0	5037	27	0
4	D	3584	0	3592	24	0
5	E	3518	0	3577	12	0
6	F	1353	0	1349	7	0
7	G	3435	0	3548	19	0
7	K	106	0	123	1	0
7	L	82	0	93	0	0
8	X	733	0	405	9	0
9	Y	722	0	399	2	0
10	A	1	0	0	0	0
10	D	1	0	0	0	0
10	G	1	0	0	0	0
11	A	31	0	12	1	0
11	D	31	0	12	1	0
11	G	31	0	12	0	0
12	E	27	0	12	0	0
13	A	1	0	0	0	0
13	B	1	0	0	0	0
13	C	3	0	0	0	0
13	G	1	0	0	0	0
13	X	8	0	0	0	0
13	Y	8	0	0	0	0
All	All	25039	0	24432	123	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 (123) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:463:LYS:HZ1	7:G:461:ASN:H	1.31	0.78
2:B:414:CYS:HB3	2:B:444:VAL:HG21	1.66	0.77
3:C:309:THR:HG21	3:C:347:GLU:HG3	1.68	0.75
4:D:401:ASN:HD22	4:D:483:MET:HE1	1.52	0.74
3:C:414:ASP:HB3	3:C:417:GLU:HG3	1.74	0.69
7:G:394:ALA:HB1	7:G:449:MET:HG3	1.75	0.69
1:A:494:THR:HG21	1:A:500:ARG:HH21	1.58	0.67
4:D:331:THR:HG22	4:D:332:THR:HG23	1.78	0.66
2:B:272:VAL:HG13	2:B:273:VAL:HG23	1.78	0.66
7:G:589:MET:HA	7:G:589:MET:HE2	1.77	0.65
7:G:467:MET:HE3	7:G:536:TYR:HE2	1.63	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
8:X:32:DC:H2'	8:X:33:DA:C8	2.35	0.61
2:B:439:SER:H	2:B:442:ILE:HG22	1.66	0.61
4:D:190:GLU:H	4:D:190:GLU:CD	2.10	0.59
2:B:219:GLU:H	2:B:219:GLU:CD	2.11	0.58
7:G:542:THR:HG22	7:G:543:GLY:H	1.68	0.58
7:G:124:MET:HG2	7:G:127:ARG:HB2	1.84	0.58
8:X:14:DA:H2'	8:X:15:DA:C8	2.38	0.57
5:E:32:ALA:HA	5:E:35:MET:HE2	1.87	0.56
4:D:308:TRP:HA	4:D:311:HIS:HD2	1.70	0.55
4:D:308:TRP:HA	4:D:311:HIS:CD2	2.40	0.55
5:E:353:ARG:HH12	6:F:216:LEU:HD22	1.72	0.55
3:C:7:LEU:HD13	3:C:23:ILE:HG23	1.88	0.55
4:D:382:LEU:HD23	4:D:503:LEU:HD12	1.90	0.54
5:E:207:LEU:HD23	5:E:271:MET:HE1	1.90	0.54
4:D:99:VAL:HG11	4:D:238:ILE:HA	1.89	0.53
7:G:391:HIS:CD2	7:G:392:PRO:HD2	2.43	0.53
3:C:494:PHE:CD1	3:C:525:LEU:HG	2.43	0.53
3:C:615:VAL:O	3:C:619:GLU:HG3	2.09	0.53
1:A:411:MET:HG2	1:A:463:GLN:HG3	1.90	0.53
8:X:8:DG:H2''	8:X:9:DA:C8	2.43	0.53
3:C:7:LEU:HD11	3:C:26:LEU:HD22	1.91	0.53
4:D:140:GLN:HA	4:D:145:MET:HE2	1.91	0.52
3:C:99:LEU:O	3:C:103:MET:HG3	2.09	0.52
7:G:167:LEU:HG	7:G:282:ILE:HD11	1.91	0.52
8:X:29:DT:H2''	8:X:30:DA:C8	2.45	0.52
3:C:261:LEU:O	3:C:265:MET:HG3	2.10	0.52
7:G:134:LEU:HD23	7:G:170:VAL:HG21	1.90	0.52
9:Y:29:DT:H2''	9:Y:30:DG:C8	2.45	0.52
2:B:273:VAL:HB	2:B:276:LYS:HG2	1.91	0.51
8:X:14:DA:H2'	8:X:15:DA:H8	1.75	0.51
2:B:463:LYS:HD2	2:B:463:LYS:H	1.76	0.51
3:C:656:GLN:O	3:C:660:GLU:HG3	2.11	0.51
4:D:151:ALA:HB2	4:D:177:ILE:HD11	1.93	0.50
4:D:142:ASP:OD1	4:D:145:MET:HG3	2.11	0.50
4:D:311:HIS:O	4:D:315:MET:HG3	2.11	0.50
5:E:255:ARG:HE	5:E:290:ALA:HB1	1.75	0.49
2:B:492:ILE:HG22	2:B:494:PHE:H	1.77	0.49
2:B:255:VAL:HG22	2:B:288:VAL:HG21	1.95	0.49
4:D:459:PRO:HB3	4:D:482:ARG:HH11	1.77	0.49
6:F:231:ILE:HG23	6:F:288:LEU:HD21	1.95	0.49
2:B:170:PHE:CE2	7:G:300:ASN:HB2	2.48	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
8:X:36:DC:H2''	8:X:37:DA:N7	2.28	0.48
3:C:509:LEU:HD13	3:C:518:LEU:HD13	1.95	0.48
5:E:116:LYS:HA	5:E:121:PHE:HB3	1.96	0.48
1:A:464:LEU:HB2	1:A:472:MET:HE3	1.95	0.48
2:B:330:ILE:HG22	2:B:332:GLN:H	1.79	0.48
2:B:363:VAL:O	2:B:365:THR:HG23	2.13	0.48
1:A:604:TYR:HE1	4:D:101:PRO:HG3	1.78	0.48
8:X:38:DT:H2''	8:X:39:DA:C8	2.49	0.48
2:B:359:VAL:HG13	3:C:558:VAL:HB	1.96	0.47
6:F:263:MET:HE3	6:F:268:VAL:HG22	1.96	0.47
4:D:48:GLU:HA	4:D:48:GLU:OE2	2.15	0.47
5:E:149:LEU:HD22	5:E:160:PHE:HE2	1.80	0.47
8:X:38:DT:H2''	8:X:39:DA:N7	2.30	0.47
4:D:328:LEU:HD11	4:D:337:GLU:HB3	1.97	0.47
4:D:469:LYS:HB3	4:D:471:LEU:HD22	1.97	0.46
5:E:399:ALA:HB3	5:E:403:SER:HB2	1.98	0.46
1:A:345:PRO:HD2	11:A:802:ATP:N1	2.31	0.45
3:C:26:LEU:O	3:C:29:ARG:HD2	2.16	0.45
3:C:172:LYS:H	3:C:172:LYS:HG2	1.58	0.45
2:B:479:VAL:HG23	2:B:493:PRO:HD3	1.97	0.45
1:A:322:PRO:HG2	1:A:325:LEU:HD23	1.98	0.45
2:B:176:ALA:HB2	3:C:653:TRP:NE1	2.31	0.45
4:D:492:GLU:O	4:D:496:MET:HG3	2.17	0.45
2:B:412:ILE:HG21	2:B:503:LEU:HB2	1.99	0.44
3:C:187:LEU:HD23	5:E:73:LEU:HD21	2.00	0.44
3:C:228:LEU:HD23	3:C:272:ILE:HD13	2.00	0.44
6:F:275:THR:HA	6:F:278:ILE:HG12	2.00	0.44
7:G:149:PRO:HG3	7:G:273:LYS:HE2	2.00	0.44
5:E:123:LYS:HB2	5:E:123:LYS:HE2	1.74	0.43
4:D:311:HIS:ND1	4:D:315:MET:HE2	2.33	0.43
4:D:350:ASN:O	4:D:350:ASN:CG	2.61	0.43
2:B:368:PRO:HB2	2:B:370:THR:HG23	2.00	0.43
5:E:130:ASP:HA	5:E:163:THR:HB	2.01	0.43
7:G:222:LYS:O	7:G:226:LYS:HG2	2.18	0.43
4:D:437:ARG:HH12	5:E:288:GLU:HG3	1.83	0.43
7:G:160:GLY:HA3	7:G:408:ASP:OD1	2.18	0.43
3:C:429:MET:HE3	3:C:429:MET:HB3	1.83	0.43
4:D:83:LEU:HD13	4:D:96:CYS:HB2	2.01	0.42
9:Y:21:DA:H2'	9:Y:22:DT:H71	2.01	0.42
2:B:463:LYS:HD2	2:B:463:LYS:N	2.33	0.42
5:E:323:HIS:ND1	5:E:404:MET:HE2	2.34	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:G:488:ILE:O	7:G:491:ILE:HG22	2.19	0.42
4:D:452:GLU:HG2	4:D:457:LEU:HB2	2.02	0.42
8:X:15:DA:H2'	8:X:16:DT:C6	2.55	0.42
1:A:346:CYS:SG	1:A:527:LEU:HD23	2.59	0.42
7:G:253:ASP:HA	7:G:256:MET:HG3	2.02	0.42
3:C:387:ILE:HG23	3:C:391:LEU:HD22	2.01	0.42
7:G:124:MET:HE2	7:G:127:ARG:HG3	2.01	0.42
2:B:477:MET:H	2:B:477:MET:HG2	1.60	0.42
6:F:337:TRP:O	6:F:341:MET:HG2	2.20	0.41
3:C:400:ARG:HD3	3:C:405:PHE:CZ	2.55	0.41
4:D:107:THR:HB	11:D:601:ATP:O1A	2.19	0.41
7:G:189:MET:HE3	7:G:189:MET:HB3	1.94	0.41
1:A:327:PRO:HB3	1:A:539:SER:HB2	2.02	0.41
3:C:524:ILE:HD13	3:C:524:ILE:HA	1.84	0.41
7:G:515:HIS:ND1	7:G:515:HIS:C	2.79	0.41
2:B:413:TYR:O	2:B:417:GLU:HG2	2.21	0.41
6:F:339:ALA:O	6:F:343:VAL:HG13	2.21	0.41
3:C:103:MET:HE2	3:C:103:MET:HB3	1.91	0.41
1:A:405:PHE:CE2	7:K:9:PRO:HG2	2.56	0.41
2:B:496:LYS:HE3	2:B:496:LYS:HB3	1.90	0.41
3:C:427:HIS:O	3:C:431:ILE:HG23	2.21	0.41
4:D:381:GLU:OE2	4:D:450:LYS:HG2	2.21	0.41
3:C:132:GLU:HG3	3:C:136:GLU:OE2	2.22	0.40
3:C:457:GLU:HB2	3:C:463:PHE:HE2	1.85	0.40
3:C:621:MET:HE3	3:C:621:MET:HB3	1.91	0.40
6:F:340:SER:O	6:F:343:VAL:HG22	2.21	0.40
2:B:159:ALA:HB2	2:B:386:GLU:HG3	2.03	0.40
3:C:126:ILE:HG12	3:C:306:ALA:HB2	2.03	0.40
3:C:336:GLU:HG2	3:C:340:LYS:HE3	2.04	0.40
7:G:512:CYS:HA	7:G:515:HIS:CE1	2.57	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	412/861 (48%)	407 (99%)	5 (1%)	0	100	100
2	B	367/509 (72%)	360 (98%)	7 (2%)	0	100	100
3	C	622/685 (91%)	616 (99%)	6 (1%)	0	100	100
4	D	435/511 (85%)	428 (98%)	7 (2%)	0	100	100
5	E	433/465 (93%)	426 (98%)	7 (2%)	0	100	100
6	F	158/365 (43%)	157 (99%)	1 (1%)	0	100	100
7	G	429/605 (71%)	424 (99%)	5 (1%)	0	100	100
7	K	12/605 (2%)	11 (92%)	1 (8%)	0	100	100
7	L	7/605 (1%)	7 (100%)	0	0	100	100
All	All	2875/5211 (55%)	2836 (99%)	39 (1%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	359/748 (48%)	359 (100%)	0	100	100
2	B	334/451 (74%)	330 (99%)	4 (1%)	63	77
3	C	564/614 (92%)	561 (100%)	3 (0%)	81	88
4	D	400/449 (89%)	397 (99%)	3 (1%)	73	83
5	E	395/417 (95%)	391 (99%)	4 (1%)	68	80
6	F	141/316 (45%)	140 (99%)	1 (1%)	76	85
7	G	374/522 (72%)	370 (99%)	4 (1%)	65	79
7	K	11/522 (2%)	11 (100%)	0	100	100
7	L	9/522 (2%)	9 (100%)	0	100	100
All	All	2587/4561 (57%)	2568 (99%)	19 (1%)	73	85

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	110	SER
2	B	116	THR
2	B	275	ASN
2	B	319	LYS
3	C	197	ASP
3	C	525	LEU
3	C	674	VAL
4	D	299	ASP
4	D	471	LEU
4	D	491	GLN
5	E	4	LYS
5	E	88	GLU
5	E	170	ARG
5	E	364	ARG
6	F	322	SER
7	G	104	LYS
7	G	396	GLN
7	G	423	SER
7	G	515	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	436	ASN
1	A	626	ASN
2	B	309	ASN
2	B	323	HIS
3	C	72	ASN
3	C	98	ASN
3	C	157	HIS
3	C	390	ASN
3	C	540	GLN
3	C	633	GLN
4	D	416	GLN
5	E	144	HIS
5	E	232	GLN
5	E	394	GLN
5	E	402	GLN
6	F	300	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 7 ligands modelled in this entry, 3 are monoatomic - leaving 4 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	$\# Z > 2$
12	ADP	E	501	-	28,29,29	1.39	4 (14%)	43,45,45	1.83	9 (20%)
11	ATP	D	601	10	32,33,33	0.46	0	48,52,52	0.33	0
11	ATP	G	702	10	32,33,33	0.35	0	48,52,52	0.34	0
11	ATP	A	802	10	32,33,33	0.43	0	48,52,52	0.34	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
12	ADP	E	501	-	-	3/16/32/32	0/3/3/3
11	ATP	D	601	10	-	4/22/38/38	0/3/3/3
11	ATP	G	702	10	-	4/22/38/38	0/3/3/3
11	ATP	A	802	10	-	2/22/38/38	0/3/3/3

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
12	E	501	ADP	C5-C4	4.55	1.47	1.39
12	E	501	ADP	C5-C6	2.65	1.48	1.41
12	E	501	ADP	C5-N7	-2.39	1.34	1.39
12	E	501	ADP	C8-N7	2.17	1.35	1.31

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
12	E	501	ADP	C5-C4-N3	-5.83	118.70	126.72
12	E	501	ADP	N3-C4-N9	4.62	135.02	127.17
12	E	501	ADP	C2-N3-C4	3.67	120.80	111.83
12	E	501	ADP	C4-C5-N7	-3.45	106.64	110.58
12	E	501	ADP	N3-C2-N1	-3.19	123.75	128.58
12	E	501	ADP	C4-N9-C8	2.63	108.50	105.74
12	E	501	ADP	C5-N7-C8	2.53	107.42	103.45
12	E	501	ADP	C3'-C2'-C1'	2.19	105.61	101.46
12	E	501	ADP	C6-C5-N7	2.03	136.00	132.09

There are no chirality outliers.

All (13) torsion outliers are listed below:

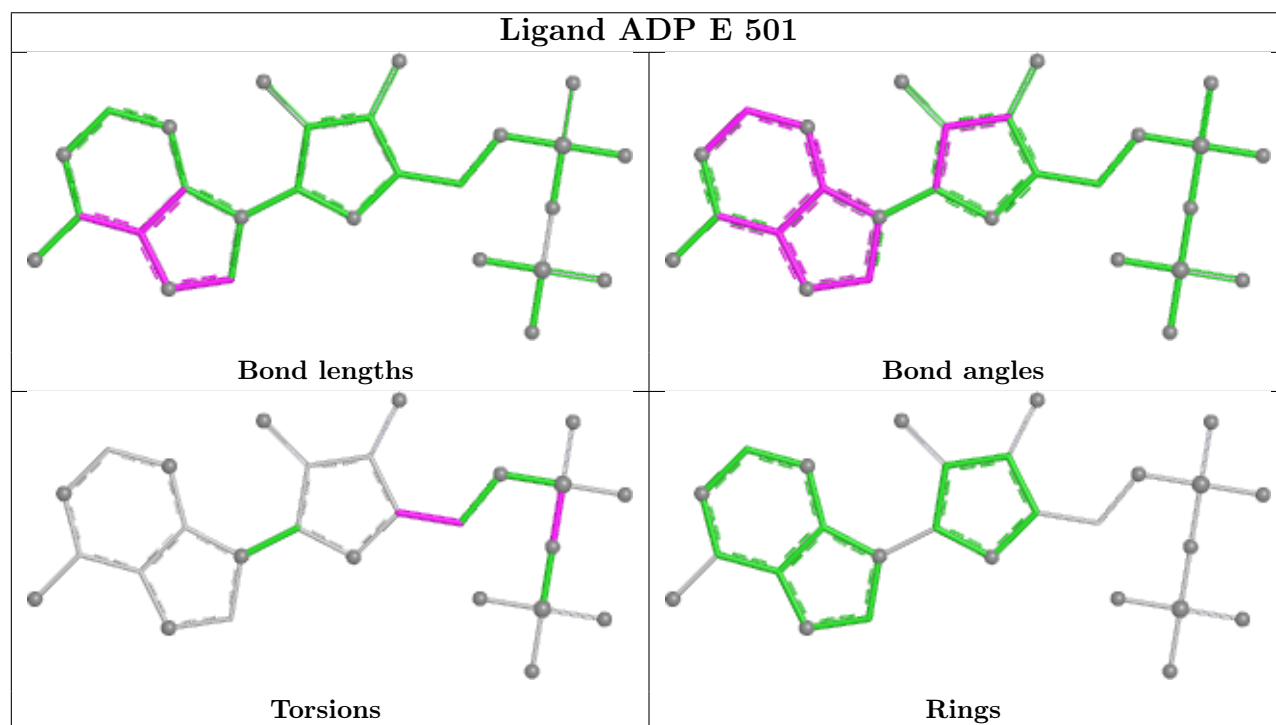
Mol	Chain	Res	Type	Atoms
11	G	702	ATP	O4'-C4'-C5'-O5'
11	G	702	ATP	C3'-C4'-C5'-O5'
12	E	501	ADP	O4'-C4'-C5'-O5'
11	D	601	ATP	O4'-C4'-C5'-O5'
11	D	601	ATP	PG-O3B-PB-O1B
11	G	702	ATP	PG-O3B-PB-O1B
11	G	702	ATP	PG-O3B-PB-O2B
12	E	501	ADP	PB-O3A-PA-O1A
12	E	501	ADP	PB-O3A-PA-O2A
11	D	601	ATP	C4'-C5'-O5'-PA
11	A	802	ATP	PG-O3B-PB-O1B
11	A	802	ATP	PG-O3B-PB-O2B
11	D	601	ATP	PG-O3B-PB-O2B

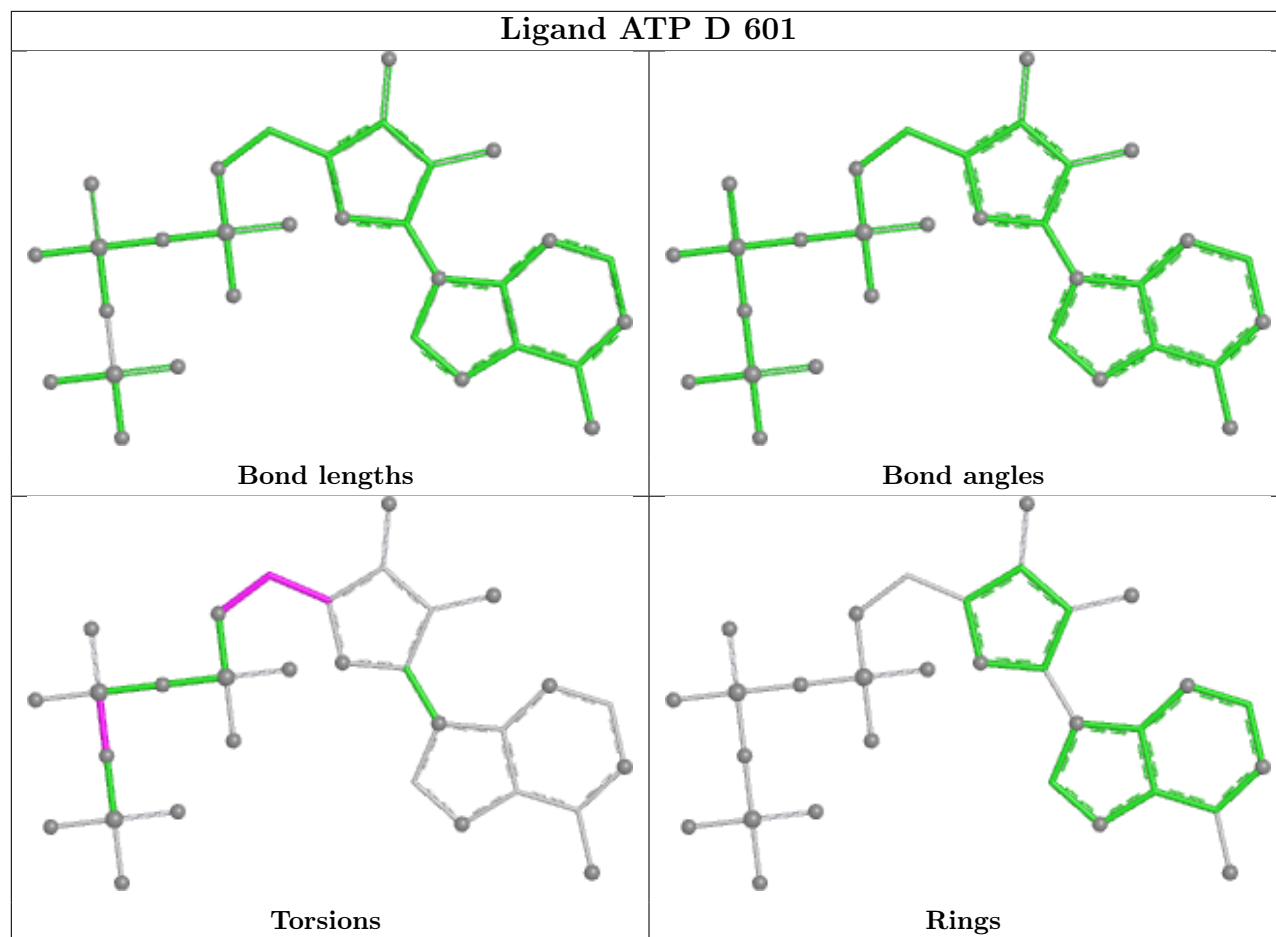
There are no ring outliers.

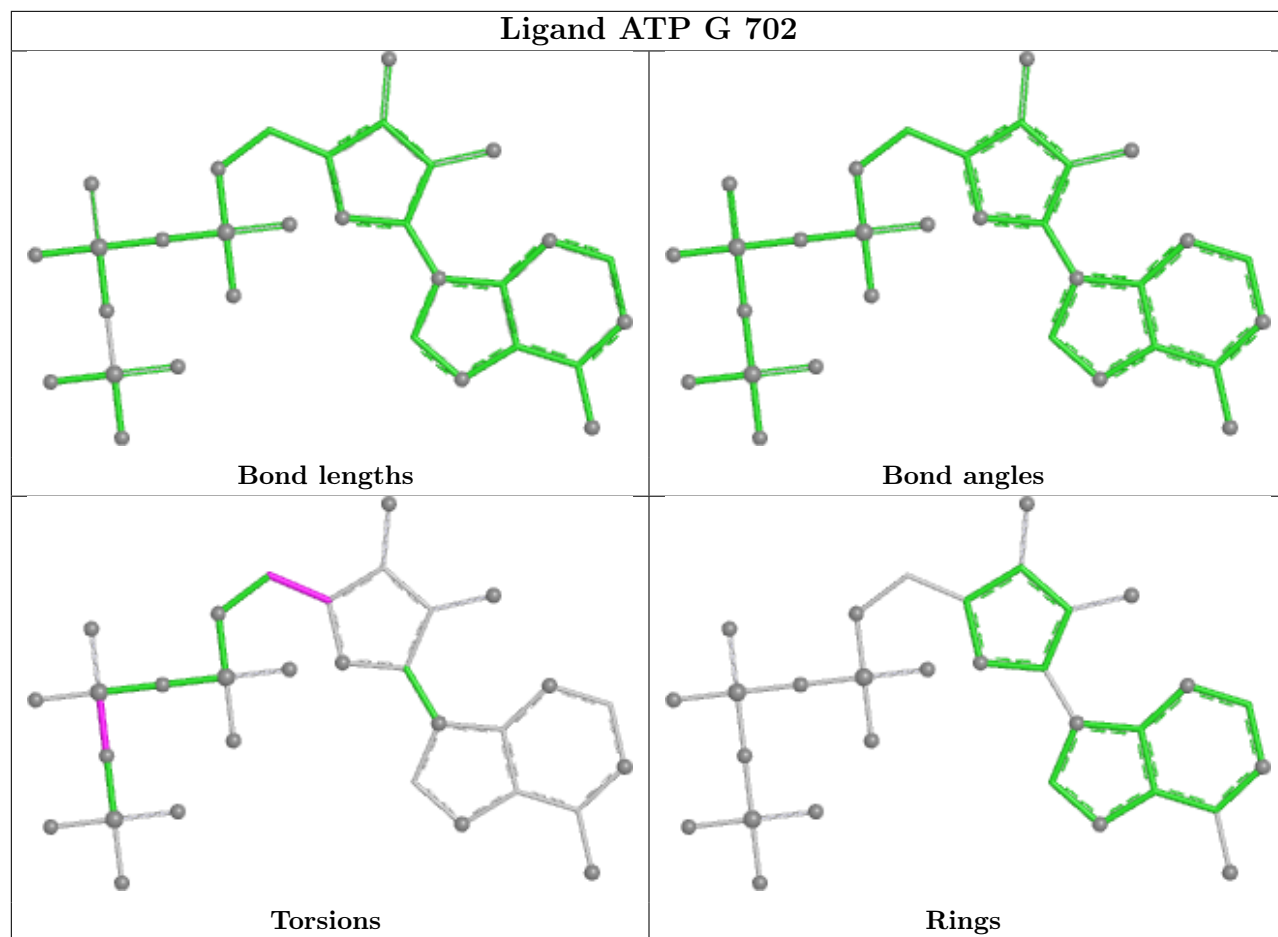
2 monomers are involved in 2 short contacts:

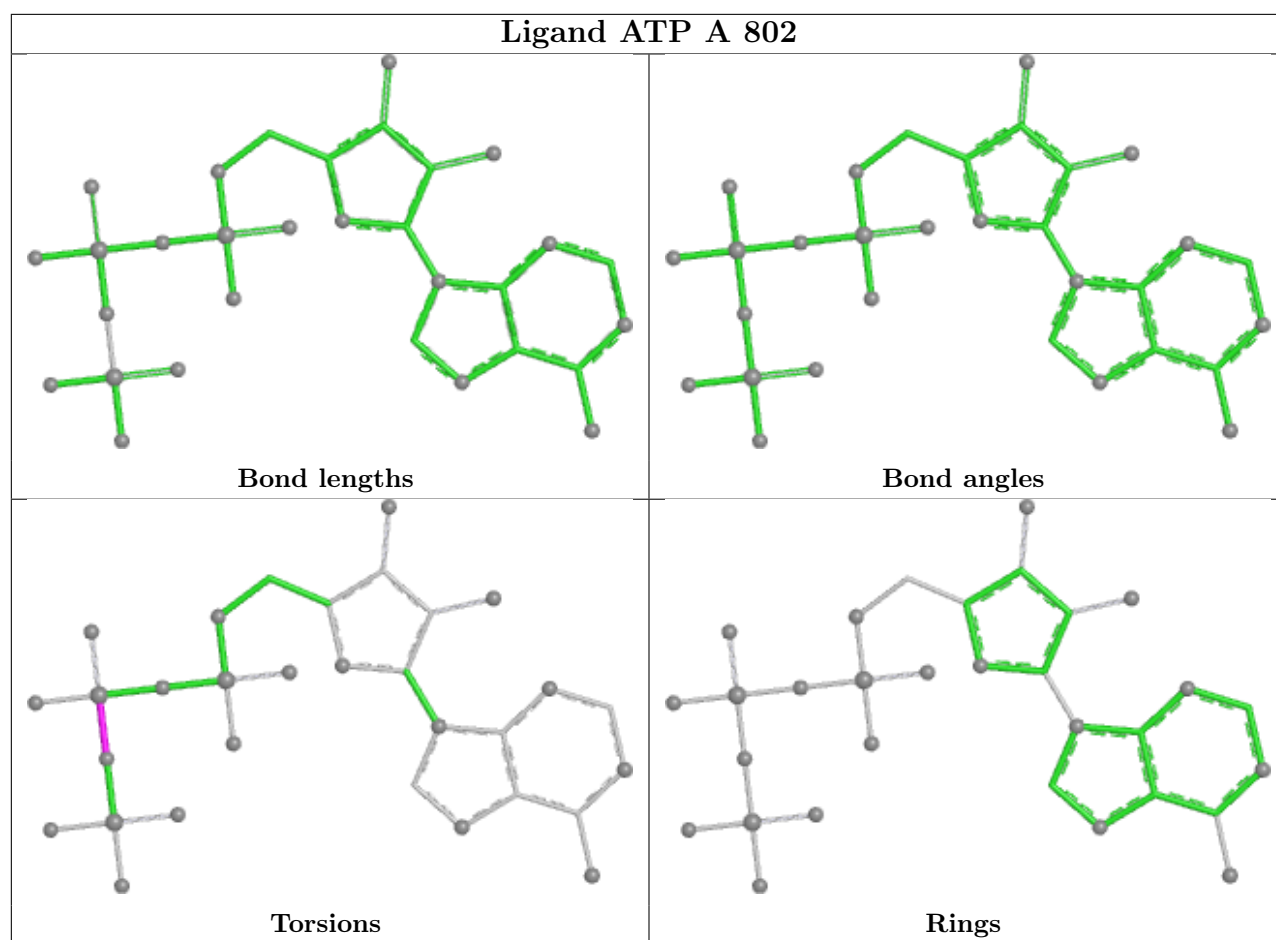
Mol	Chain	Res	Type	Clashes	Symm-Clashes
11	D	601	ATP	1	0
11	A	802	ATP	1	0

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 [i](#)

There are no chain breaks in this entry.

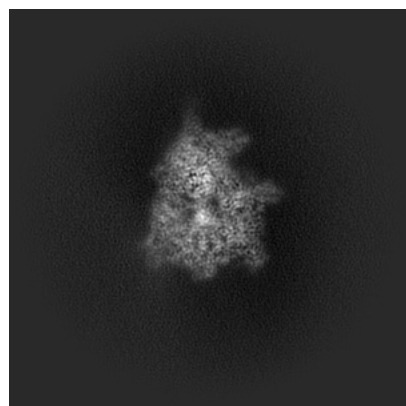
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-76021. These allow visual inspection of the internal detail of the map and identification of artifacts.

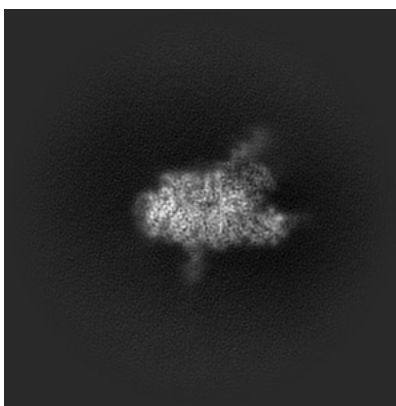
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

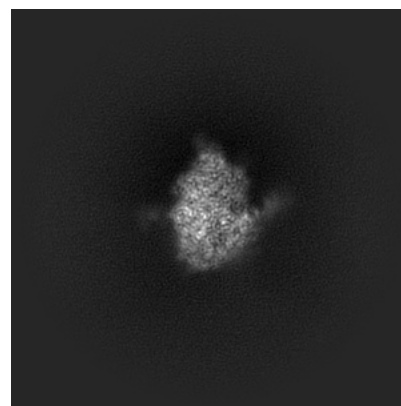
6.1.1 Primary map



X

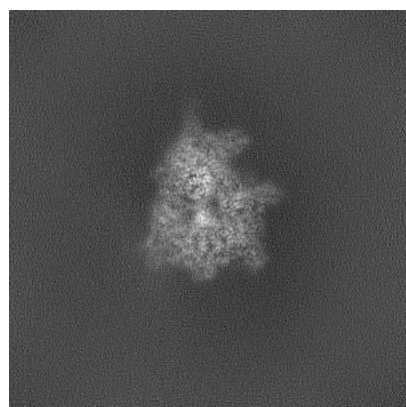


Y

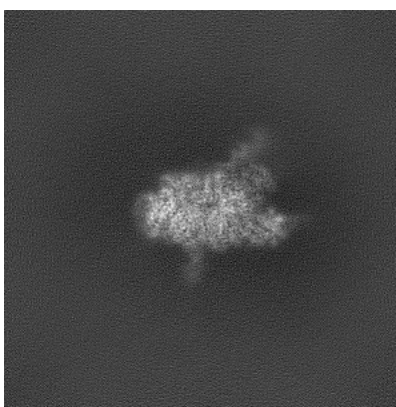


Z

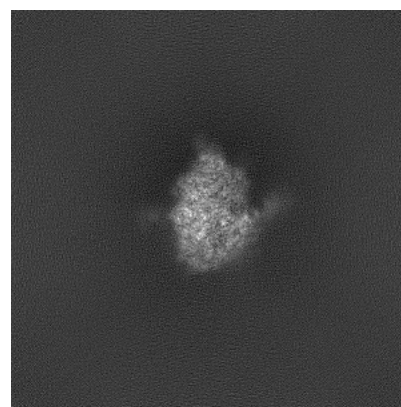
6.1.2 Raw map



X



Y

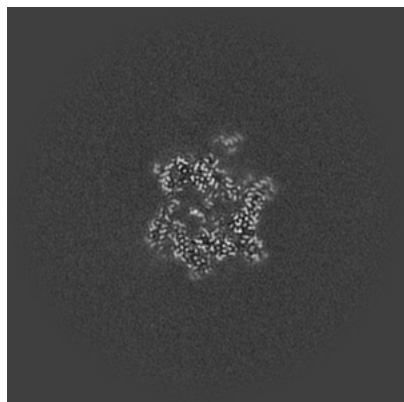


Z

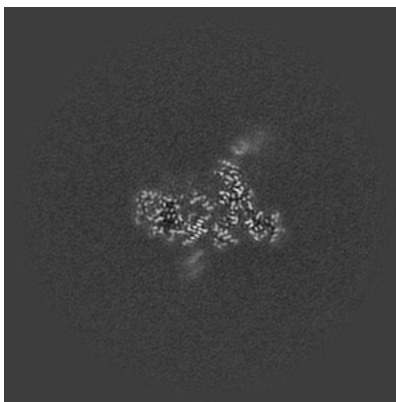
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

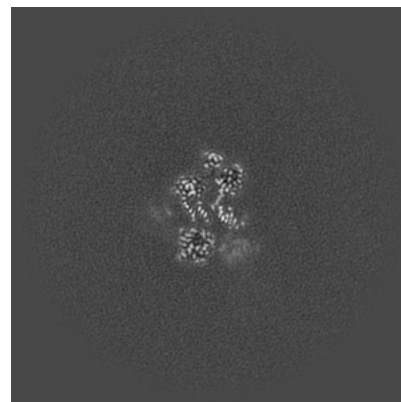
6.2.1 Primary map



X Index: 220

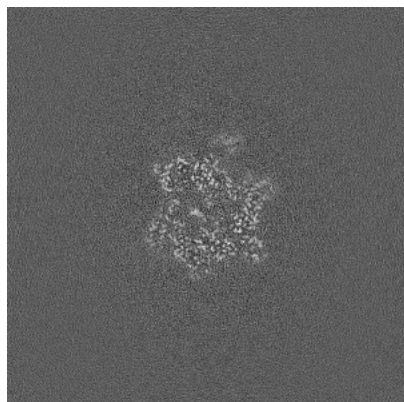


Y Index: 220

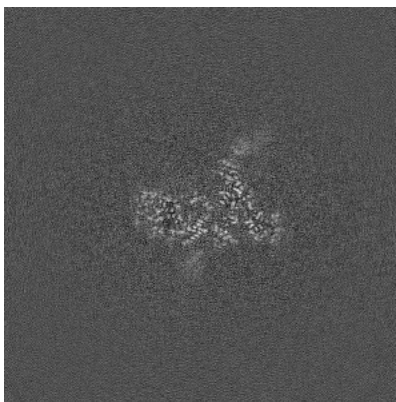


Z Index: 220

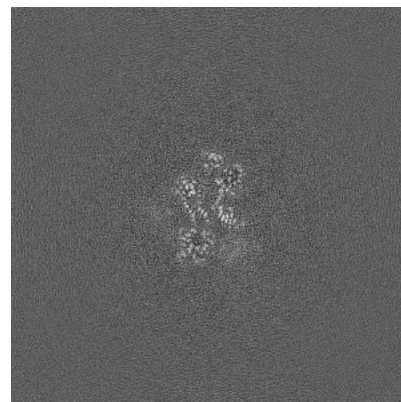
6.2.2 Raw map



X Index: 220



Y Index: 220

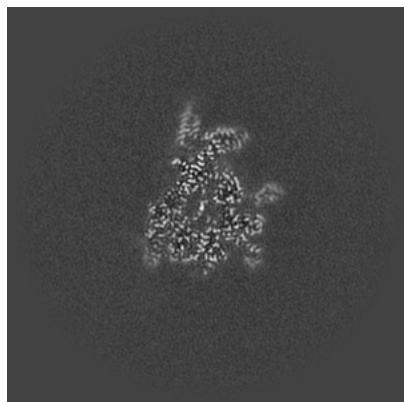


Z Index: 220

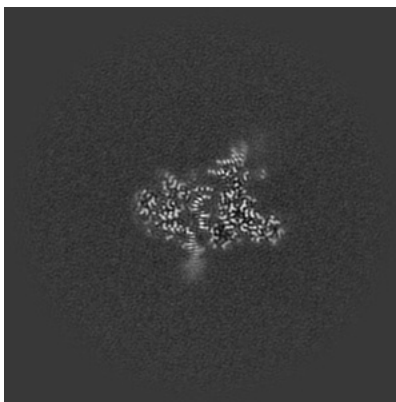
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

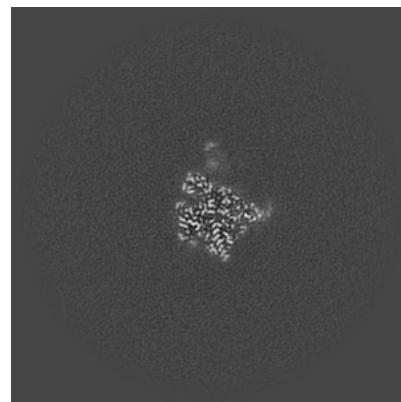
6.3.1 Primary map



X Index: 210

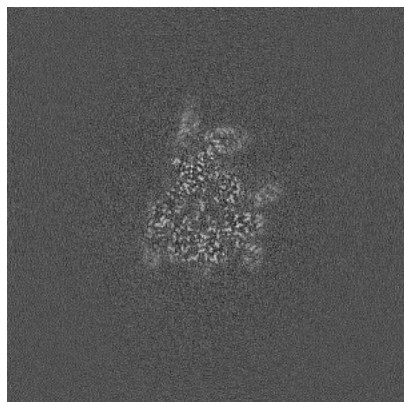


Y Index: 214

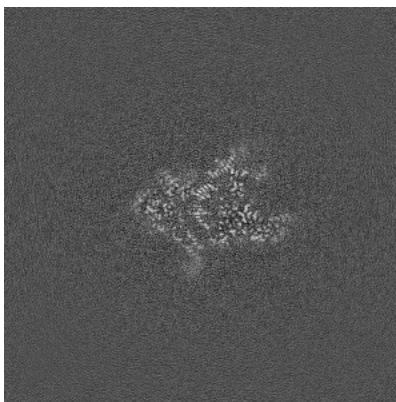


Z Index: 250

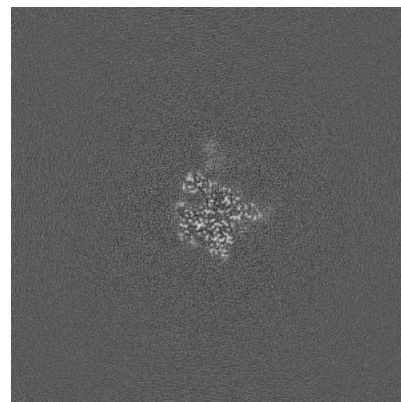
6.3.2 Raw map



X Index: 211



Y Index: 210

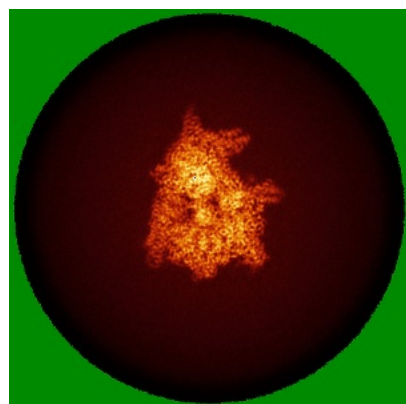


Z Index: 249

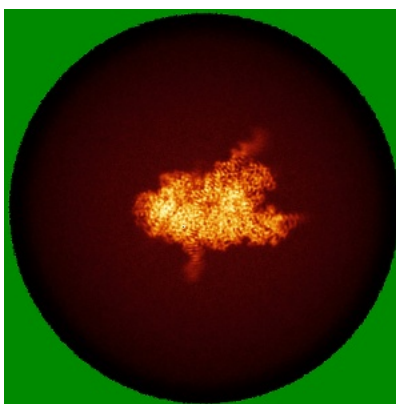
The images above show the largest variance slices of the map in three orthogonal directions.

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

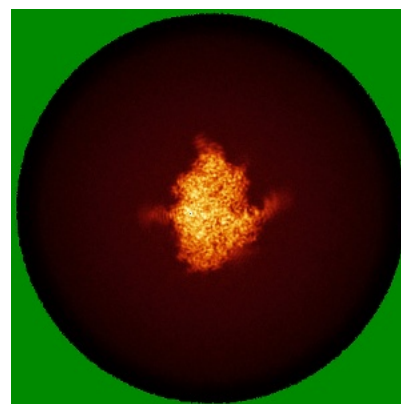
6.4.1 Primary map



X

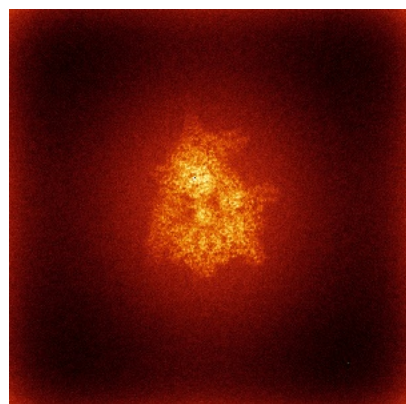


Y

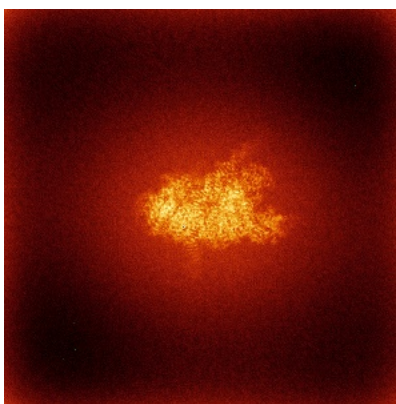


Z

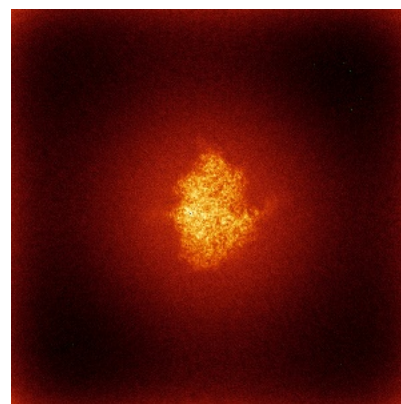
6.4.2 Raw map



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.

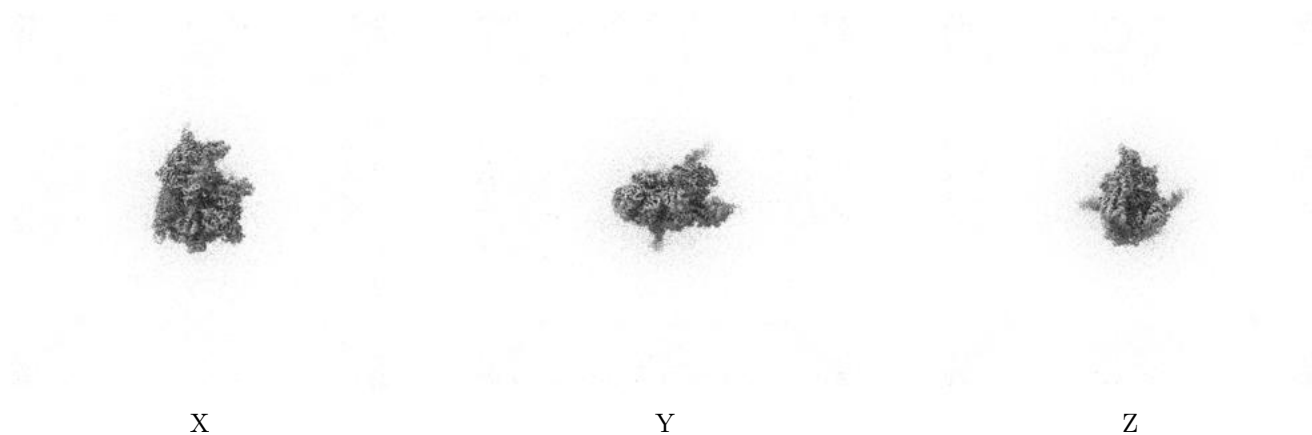
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.15. 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.

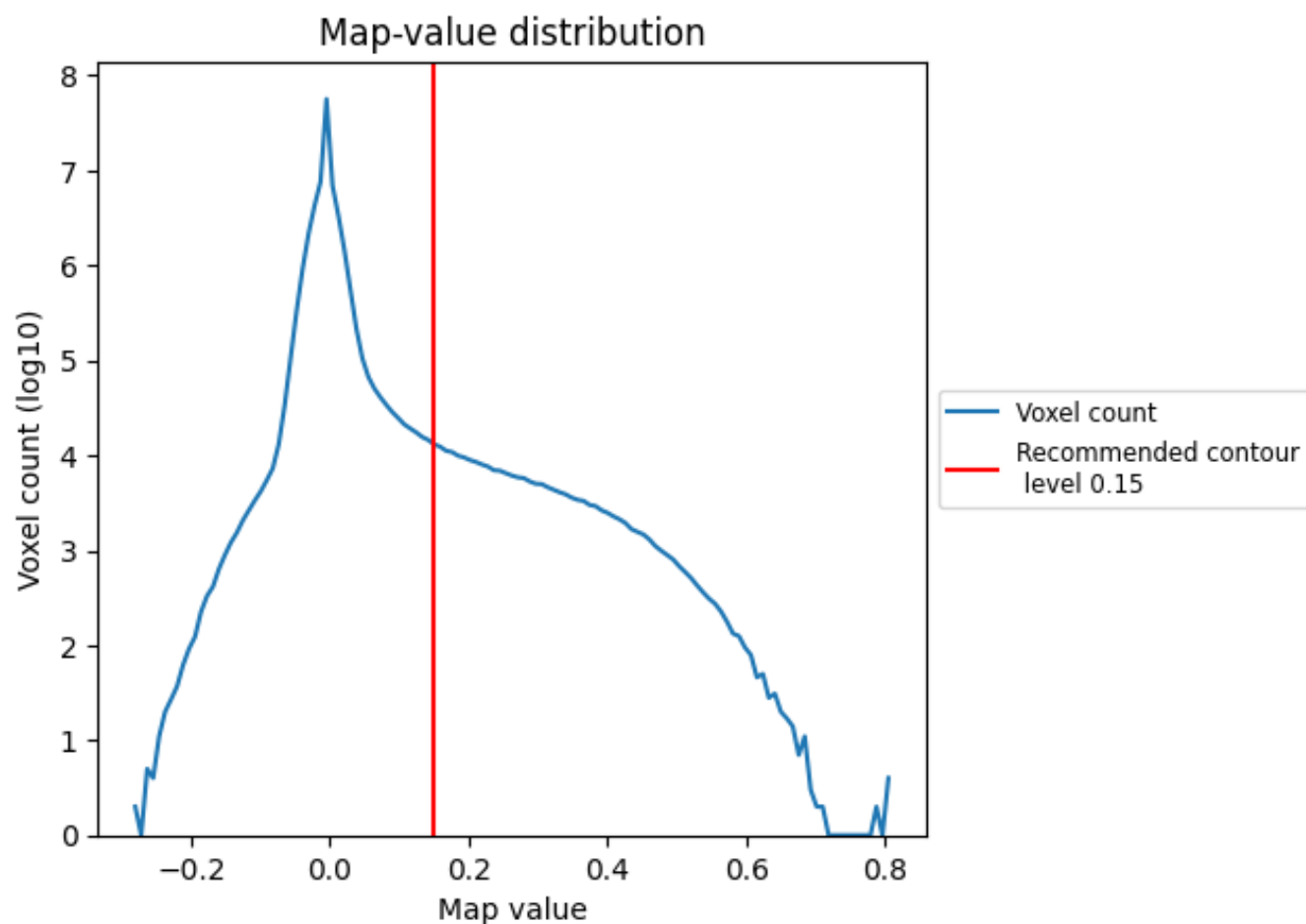
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

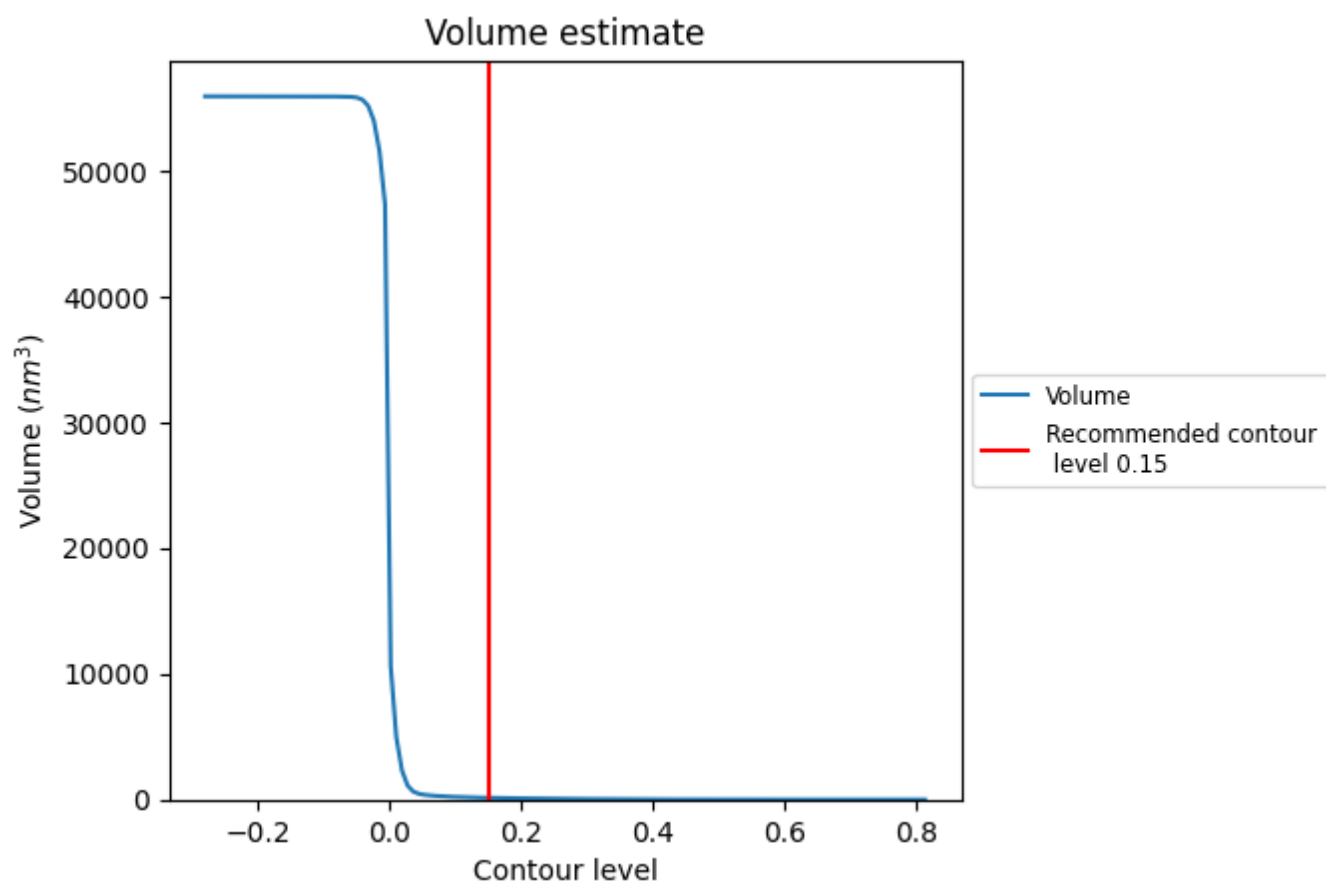
This section contains the results of statistical analysis of the map.

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.

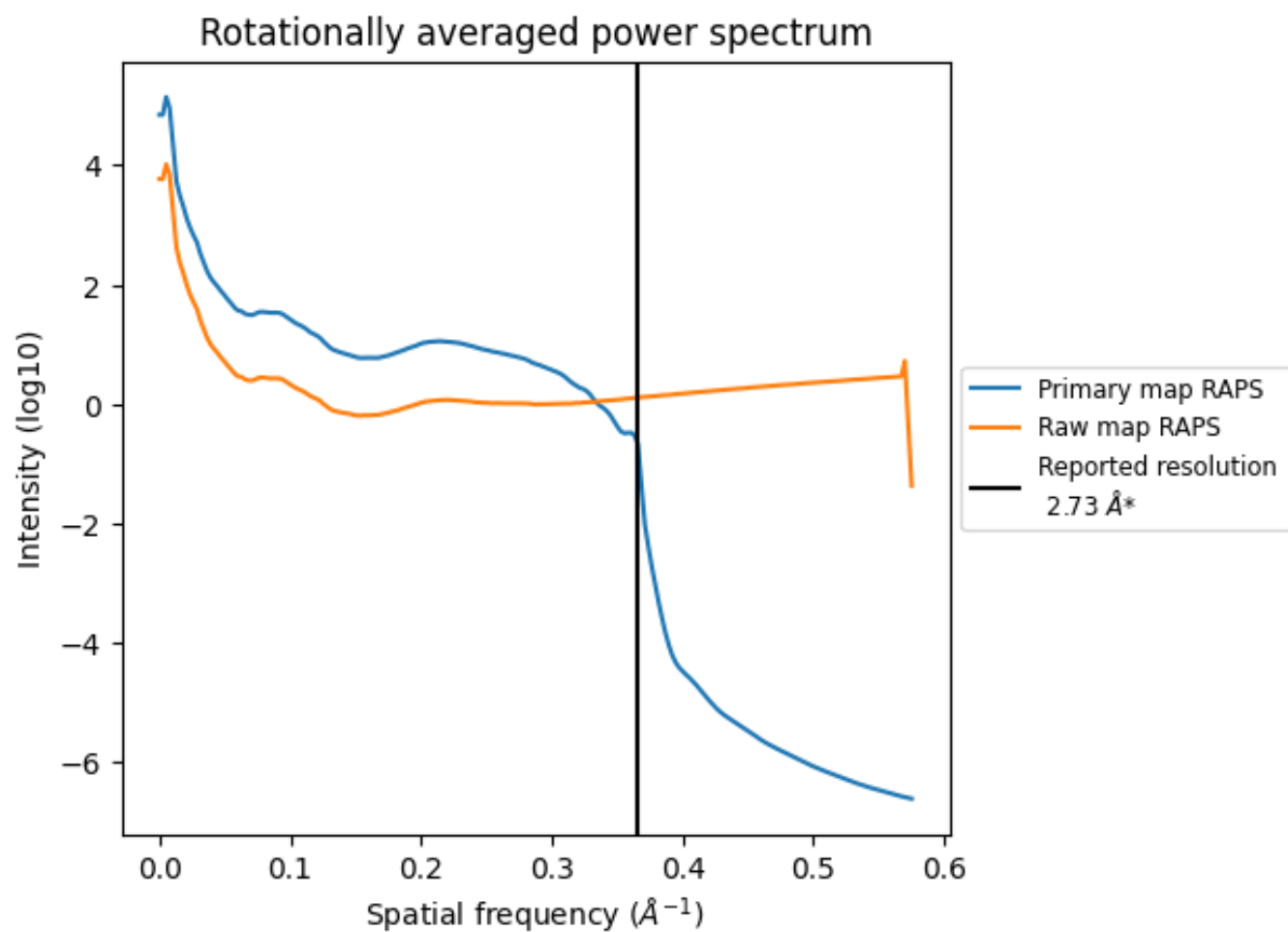
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 140 nm³; this corresponds to an approximate mass of 126 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 ⓘ

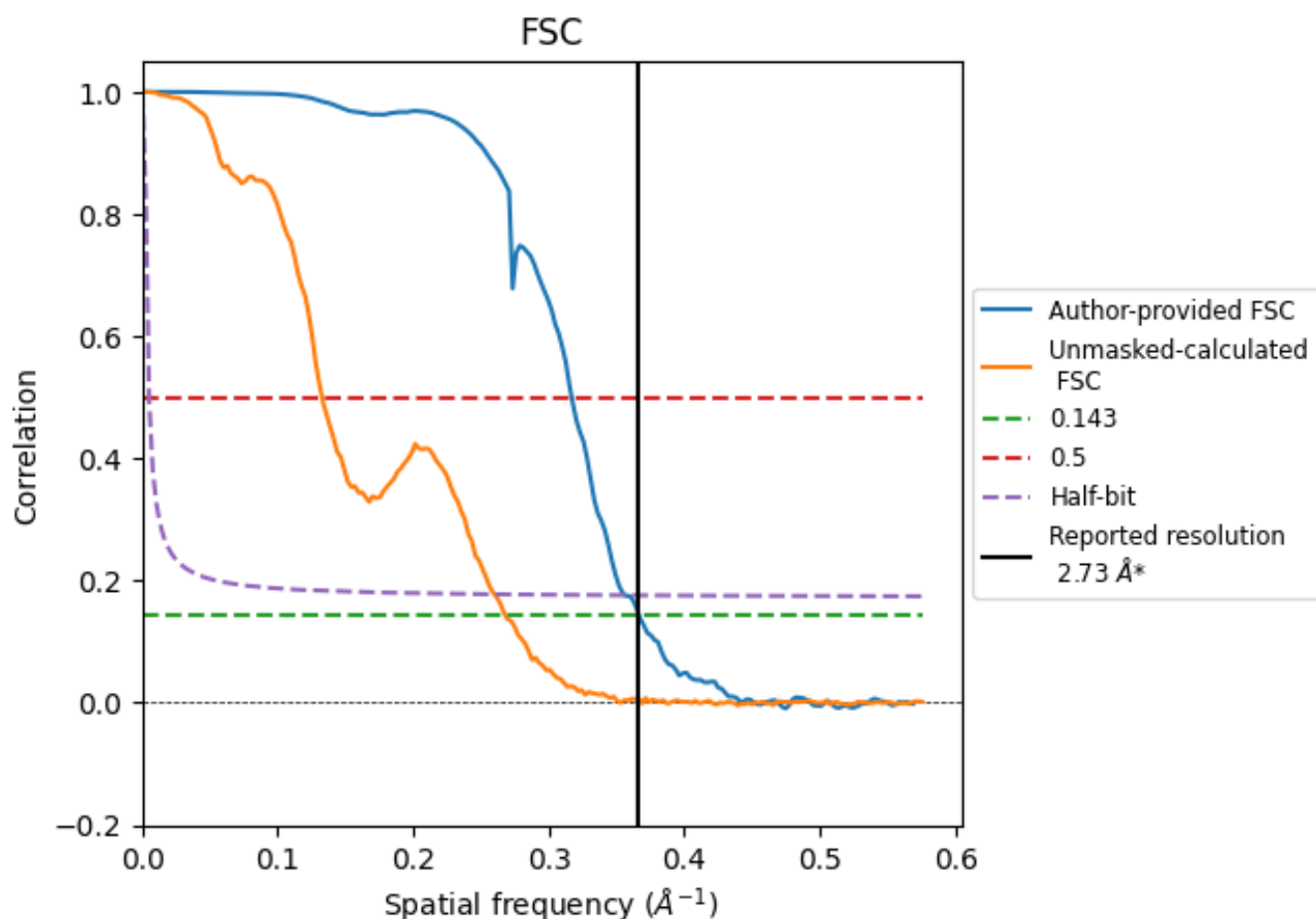


*Reported resolution corresponds to spatial frequency of 0.366 Å⁻¹

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 0.366 $\text{\AA}^{-1}$

8.2 Resolution estimates [i](#)

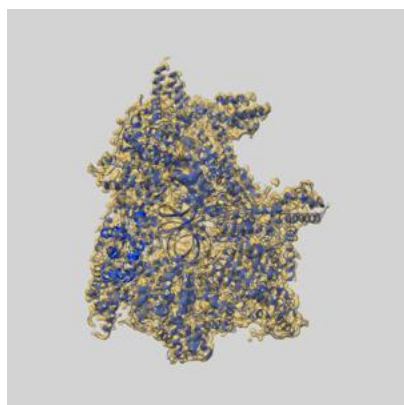
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.73	-	-
Author-provided FSC curve	2.73	3.16	2.81
Unmasked-calculated*	3.73	7.54	3.85

*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 3.73 differs from the reported value 2.73 by more than 10 %

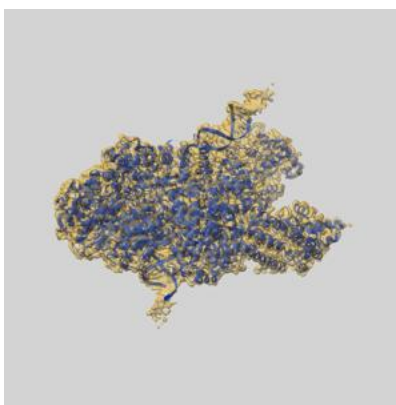
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-76021 and PDB model 11ST. Per-residue inclusion information can be found in section [3](#) on page [11](#).

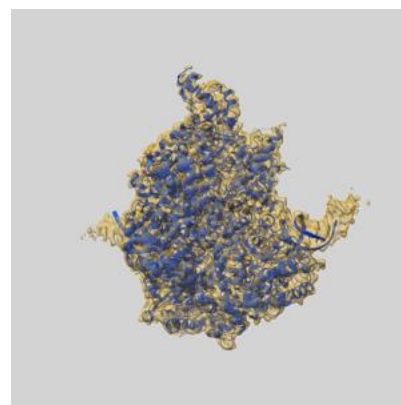
9.1 Map-model overlay [i](#)



X



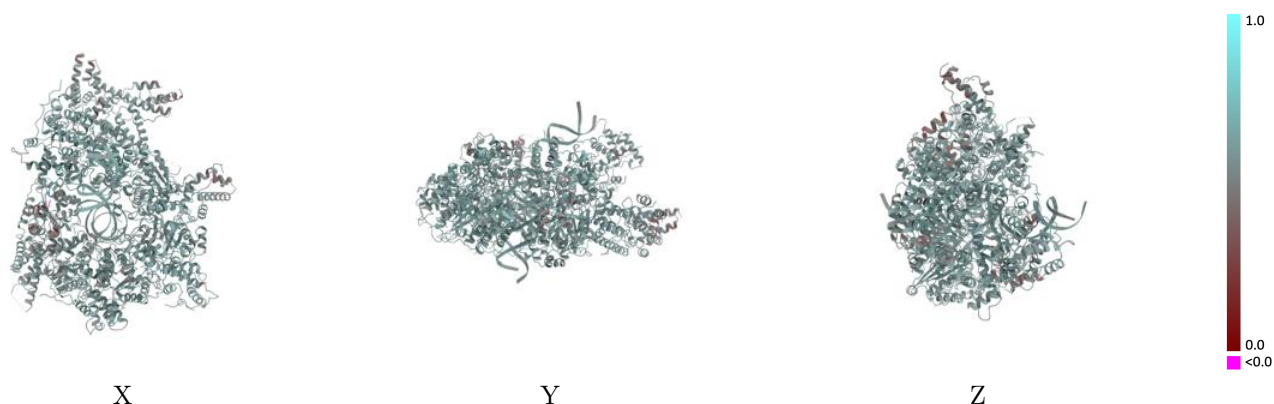
Y



Z

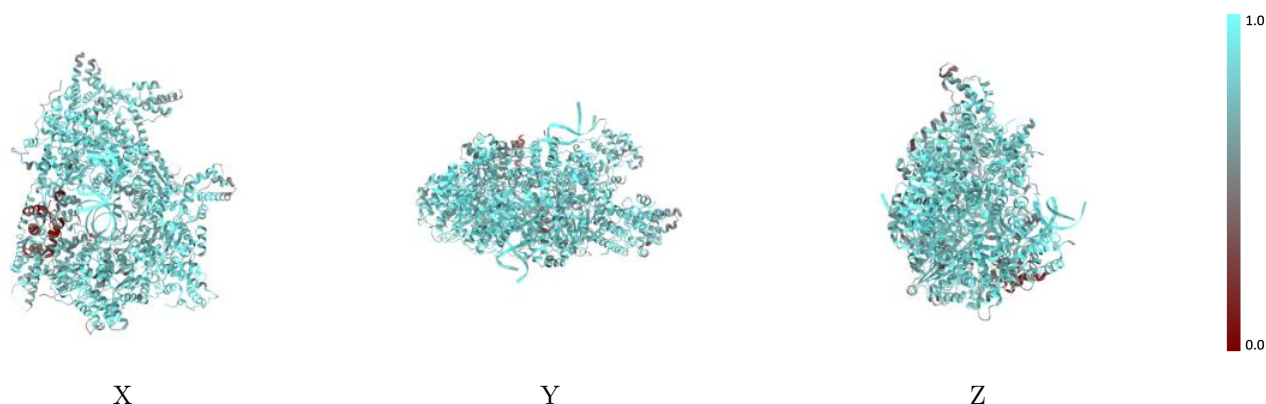
The images above show the 3D surface view of the map at the recommended contour level 0.15 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



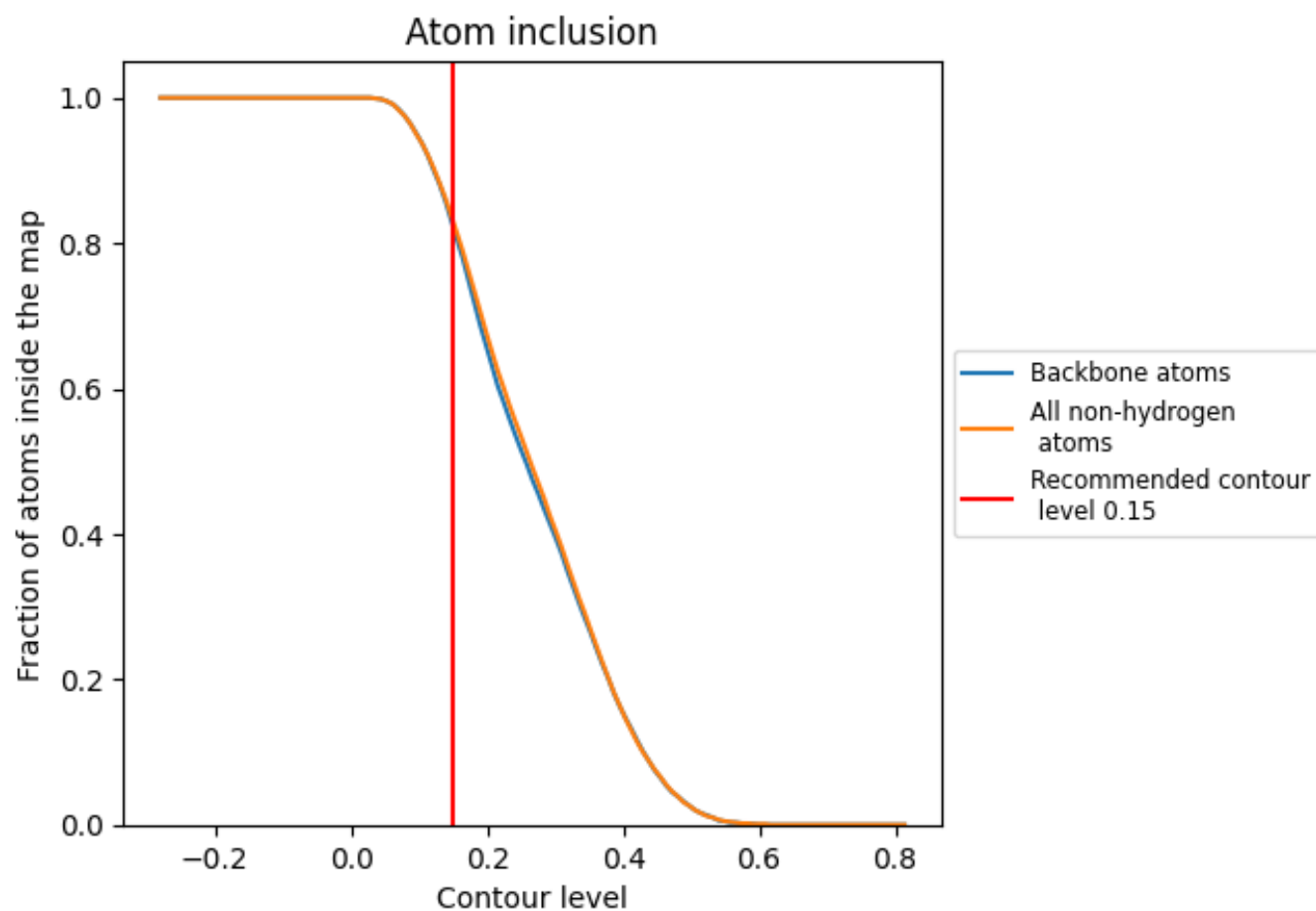
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.15).

9.4 Atom inclusion [i](#)



At the recommended contour level, 82% of all backbone atoms, 83% 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 (0.15) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8300	0.5800
A	0.8510	0.5860
B	0.7260	0.5640
C	0.8480	0.5780
D	0.8810	0.5930
E	0.8640	0.5840
F	0.8300	0.5620
G	0.7830	0.5750
K	0.6080	0.5770
L	0.5540	0.5500
X	0.9660	0.5940
Y	0.9740	0.6000

1.0

0.0

<0.0