wwPDB EM Validation Summary Report (i)

Jan 6, 2026 – 11:04 AM JST

PDB ID	:	9VKP / pdb_00009vkp
EMDB ID	:	EMD-65138
Title	:	Cryo-EM structure of F-ATP synthase from Mycobacteroides abscessus (Rotational State 1)
Authors	:	Fong, T.C.; Saw, W.-G.; Mathiyazakan, V.; Wong, C.F.; Grueber, G.
Deposited on	:	2025-06-23
Resolution	:	2.94 Å(reported)
Based on initial model	:	.

This is a wwPDB EM Validation Summary 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 (i) 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 (i)) were used in the production of this report:

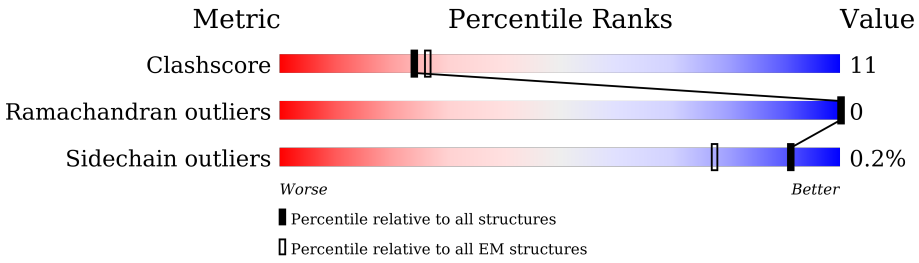
EMDB validation analysis	:	0.0.1.dev129
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive 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)	:	2.47

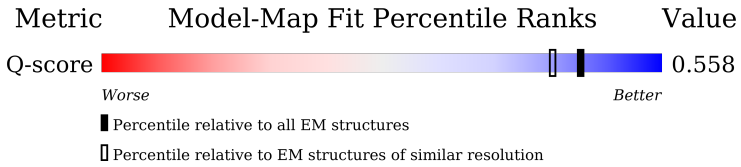
1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.94 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.





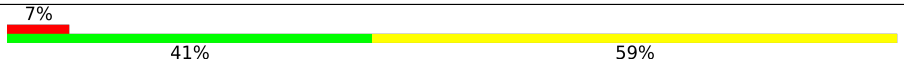
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
Q-score	-	25397	13068 (2.44 - 3.44)

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 <=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	548	80% 17% .
1	B	548	80% 15% 5%
1	C	548	79% 16% 5%
2	D	515	77% 13% 10%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	E	515	
2	F	515	
3	G	308	
4	H	121	
5	b	177	
6	d	448	

2 Entry composition (i)

There are 9 unique types of molecules in this entry. The entry contains 29467 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 ATP synthase subunit alpha.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	B	523	Total	C	N	O	S	0	0
			3959	2479	689	782	9		
1	C	520	Total	C	N	O	S	0	0
			3938	2466	685	779	8		
1	A	531	Total	C	N	O	S	0	0
			4021	2518	702	793	8		

- Molecule 2 is a protein called ATP synthase subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	D	465	Total	C	N	O	S	0	0
			3566	2251	610	692	13		
2	E	465	Total	C	N	O	S	0	0
			3561	2247	609	692	13		
2	F	466	Total	C	N	O	S	0	0
			3566	2250	610	693	13		

There are 117 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	477	GLY	-	expression tag	UNP B1MLW2
D	478	LEU	-	expression tag	UNP B1MLW2
D	479	SER	-	expression tag	UNP B1MLW2
D	480	GLY	-	expression tag	UNP B1MLW2
D	481	GLN	-	expression tag	UNP B1MLW2
D	482	PRO	-	expression tag	UNP B1MLW2
D	483	PRO	-	expression tag	UNP B1MLW2
D	484	ARG	-	expression tag	UNP B1MLW2
D	485	SER	-	expression tag	UNP B1MLW2
D	486	PRO	-	expression tag	UNP B1MLW2
D	487	SER	-	expression tag	UNP B1MLW2
D	488	SER	-	expression tag	UNP B1MLW2
D	489	GLY	-	expression tag	UNP B1MLW2

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
D	490	SER	-	expression tag	UNP B1MLW2
D	491	SER	-	expression tag	UNP B1MLW2
D	492	GLY	-	expression tag	UNP B1MLW2
D	493	GLY	-	expression tag	UNP B1MLW2
D	494	GLY	-	expression tag	UNP B1MLW2
D	495	GLY	-	expression tag	UNP B1MLW2
D	496	GLU	-	expression tag	UNP B1MLW2
D	497	ASN	-	expression tag	UNP B1MLW2
D	498	LEU	-	expression tag	UNP B1MLW2
D	499	TYR	-	expression tag	UNP B1MLW2
D	500	PHE	-	expression tag	UNP B1MLW2
D	501	GLN	-	expression tag	UNP B1MLW2
D	502	ASP	-	expression tag	UNP B1MLW2
D	503	TYR	-	expression tag	UNP B1MLW2
D	504	LYS	-	expression tag	UNP B1MLW2
D	505	ASP	-	expression tag	UNP B1MLW2
D	506	ASP	-	expression tag	UNP B1MLW2
D	507	ASP	-	expression tag	UNP B1MLW2
D	508	ASP	-	expression tag	UNP B1MLW2
D	509	LYS	-	expression tag	UNP B1MLW2
D	510	HIS	-	expression tag	UNP B1MLW2
D	511	HIS	-	expression tag	UNP B1MLW2
D	512	HIS	-	expression tag	UNP B1MLW2
D	513	HIS	-	expression tag	UNP B1MLW2
D	514	HIS	-	expression tag	UNP B1MLW2
D	515	HIS	-	expression tag	UNP B1MLW2
E	477	GLY	-	expression tag	UNP B1MLW2
E	478	LEU	-	expression tag	UNP B1MLW2
E	479	SER	-	expression tag	UNP B1MLW2
E	480	GLY	-	expression tag	UNP B1MLW2
E	481	GLN	-	expression tag	UNP B1MLW2
E	482	PRO	-	expression tag	UNP B1MLW2
E	483	PRO	-	expression tag	UNP B1MLW2
E	484	ARG	-	expression tag	UNP B1MLW2
E	485	SER	-	expression tag	UNP B1MLW2
E	486	PRO	-	expression tag	UNP B1MLW2
E	487	SER	-	expression tag	UNP B1MLW2
E	488	SER	-	expression tag	UNP B1MLW2
E	489	GLY	-	expression tag	UNP B1MLW2
E	490	SER	-	expression tag	UNP B1MLW2
E	491	SER	-	expression tag	UNP B1MLW2
E	492	GLY	-	expression tag	UNP B1MLW2

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
E	493	GLY	-	expression tag	UNP B1MLW2
E	494	GLY	-	expression tag	UNP B1MLW2
E	495	GLY	-	expression tag	UNP B1MLW2
E	496	GLU	-	expression tag	UNP B1MLW2
E	497	ASN	-	expression tag	UNP B1MLW2
E	498	LEU	-	expression tag	UNP B1MLW2
E	499	TYR	-	expression tag	UNP B1MLW2
E	500	PHE	-	expression tag	UNP B1MLW2
E	501	GLN	-	expression tag	UNP B1MLW2
E	502	ASP	-	expression tag	UNP B1MLW2
E	503	TYR	-	expression tag	UNP B1MLW2
E	504	LYS	-	expression tag	UNP B1MLW2
E	505	ASP	-	expression tag	UNP B1MLW2
E	506	ASP	-	expression tag	UNP B1MLW2
E	507	ASP	-	expression tag	UNP B1MLW2
E	508	ASP	-	expression tag	UNP B1MLW2
E	509	LYS	-	expression tag	UNP B1MLW2
E	510	HIS	-	expression tag	UNP B1MLW2
E	511	HIS	-	expression tag	UNP B1MLW2
E	512	HIS	-	expression tag	UNP B1MLW2
E	513	HIS	-	expression tag	UNP B1MLW2
E	514	HIS	-	expression tag	UNP B1MLW2
E	515	HIS	-	expression tag	UNP B1MLW2
F	477	GLY	-	expression tag	UNP B1MLW2
F	478	LEU	-	expression tag	UNP B1MLW2
F	479	SER	-	expression tag	UNP B1MLW2
F	480	GLY	-	expression tag	UNP B1MLW2
F	481	GLN	-	expression tag	UNP B1MLW2
F	482	PRO	-	expression tag	UNP B1MLW2
F	483	PRO	-	expression tag	UNP B1MLW2
F	484	ARG	-	expression tag	UNP B1MLW2
F	485	SER	-	expression tag	UNP B1MLW2
F	486	PRO	-	expression tag	UNP B1MLW2
F	487	SER	-	expression tag	UNP B1MLW2
F	488	SER	-	expression tag	UNP B1MLW2
F	489	GLY	-	expression tag	UNP B1MLW2
F	490	SER	-	expression tag	UNP B1MLW2
F	491	SER	-	expression tag	UNP B1MLW2
F	492	GLY	-	expression tag	UNP B1MLW2
F	493	GLY	-	expression tag	UNP B1MLW2
F	494	GLY	-	expression tag	UNP B1MLW2
F	495	GLY	-	expression tag	UNP B1MLW2

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
F	496	GLU	-	expression tag	UNP B1MLW2
F	497	ASN	-	expression tag	UNP B1MLW2
F	498	LEU	-	expression tag	UNP B1MLW2
F	499	TYR	-	expression tag	UNP B1MLW2
F	500	PHE	-	expression tag	UNP B1MLW2
F	501	GLN	-	expression tag	UNP B1MLW2
F	502	ASP	-	expression tag	UNP B1MLW2
F	503	TYR	-	expression tag	UNP B1MLW2
F	504	LYS	-	expression tag	UNP B1MLW2
F	505	ASP	-	expression tag	UNP B1MLW2
F	506	ASP	-	expression tag	UNP B1MLW2
F	507	ASP	-	expression tag	UNP B1MLW2
F	508	ASP	-	expression tag	UNP B1MLW2
F	509	LYS	-	expression tag	UNP B1MLW2
F	510	HIS	-	expression tag	UNP B1MLW2
F	511	HIS	-	expression tag	UNP B1MLW2
F	512	HIS	-	expression tag	UNP B1MLW2
F	513	HIS	-	expression tag	UNP B1MLW2
F	514	HIS	-	expression tag	UNP B1MLW2
F	515	HIS	-	expression tag	UNP B1MLW2

- Molecule 3 is a protein called ATP synthase gamma chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	G	306	Total	C	N	O	S	0	0
			2315	1451	412	448	4		

- Molecule 4 is a protein called ATP synthase epsilon chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	H	121	Total	C	N	O	S	0	0
			920	573	161	185	1		

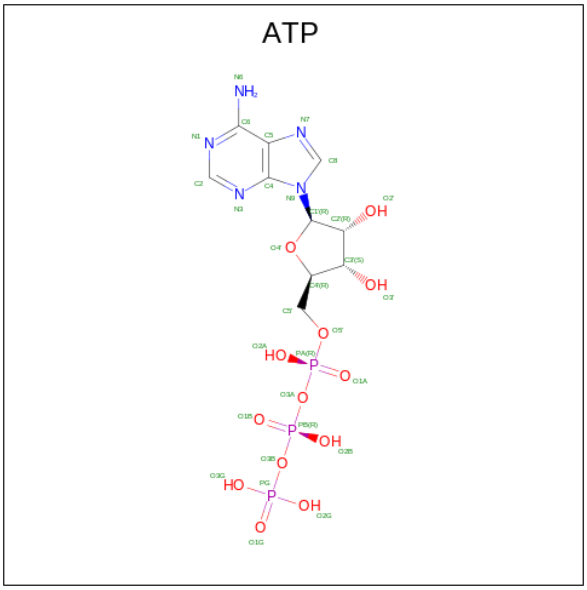
- Molecule 5 is a protein called ATP synthase subunit b.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	b	80	Total	C	N	O	S	0	0
			588	351	113	123	1		

- Molecule 6 is a protein called ATP synthase subunit b-delta.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	d	382	Total	C	N	O	S	0	0
			2850	1758	522	568	2		

- Molecule 7 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 8 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

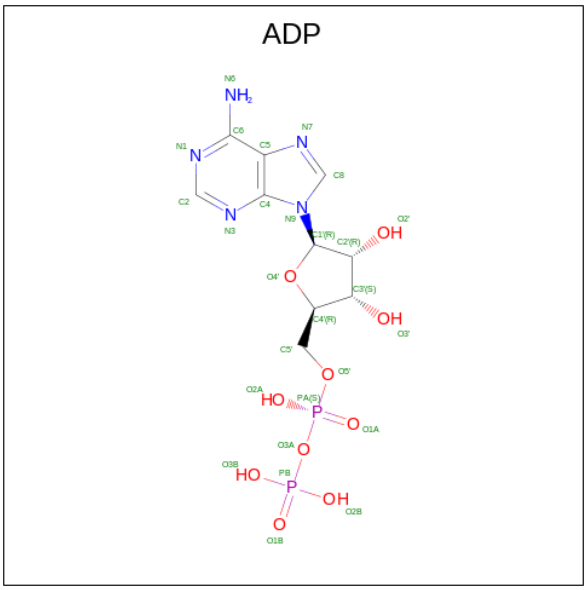
Mol	Chain	Residues	Atoms		AltConf
8	B	1	Total	Mg	0
			1	1	
8	C	1	Total	Mg	0
			1	1	
8	D	1	Total	Mg	0
			1	1	
8	E	1	Total	Mg	0
			1	1	

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms		AltConf
8	A	1	Total	Mg	0
			1	1	

- Molecule 9 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$) (labeled as "Ligand of Interest" by depositor).



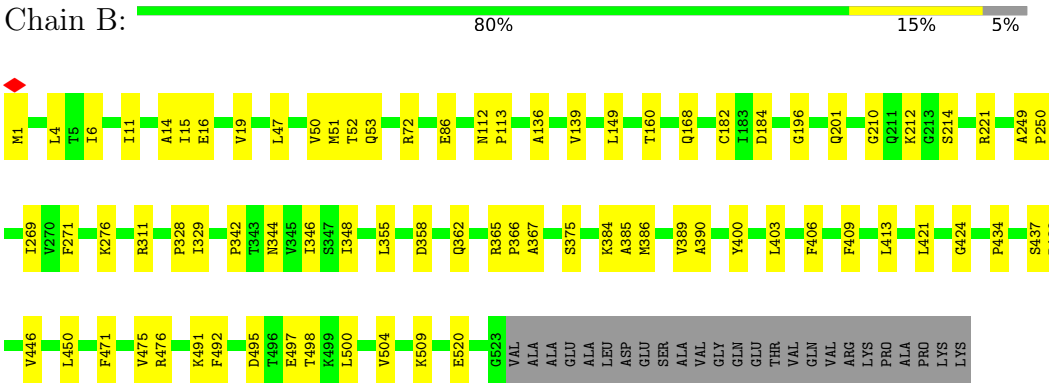
Mol	Chain	Residues	Atoms					AltConf
9	D	1	Total	C	N	O	P	0
			27	10	5	10	2	
9	E	1	Total	C	N	O	P	0
			27	10	5	10	2	

3 Residue-property plots (i)

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

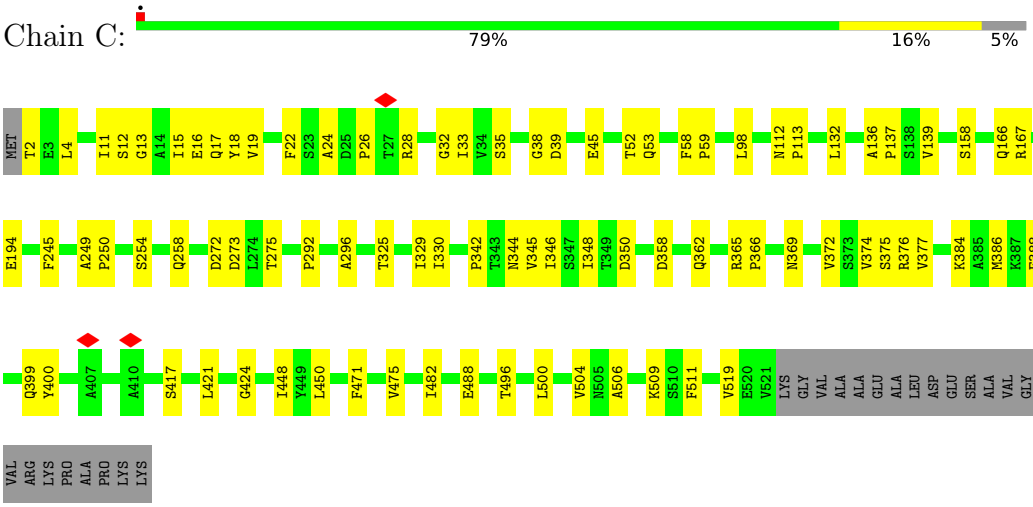
• Molecule 1: ATP synthase subunit alpha

Chain B:



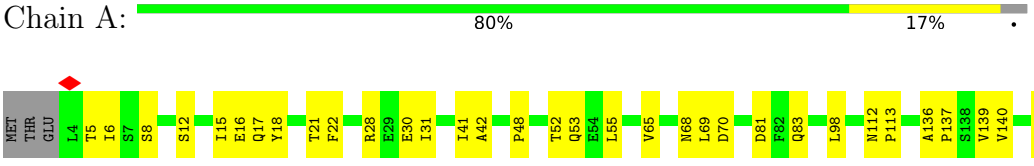
• Molecule 1: ATP synthase subunit alpha

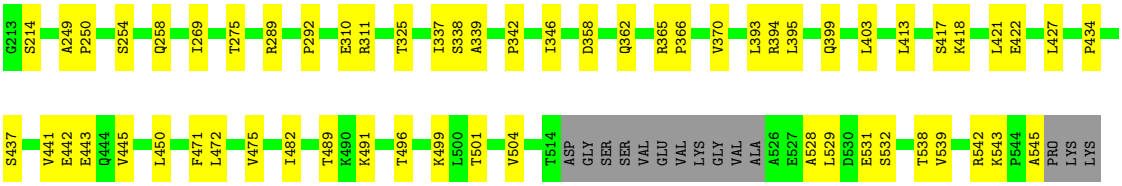
Chain C:



• Molecule 1: ATP synthase subunit alpha

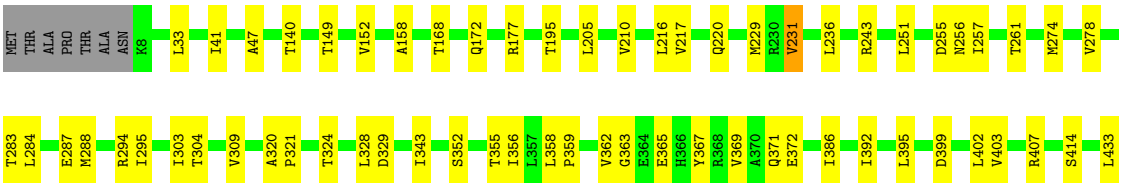
Chain A:

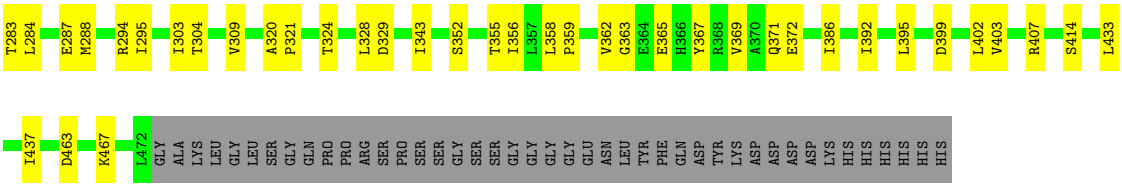




• Molecule 2: ATP synthase subunit beta

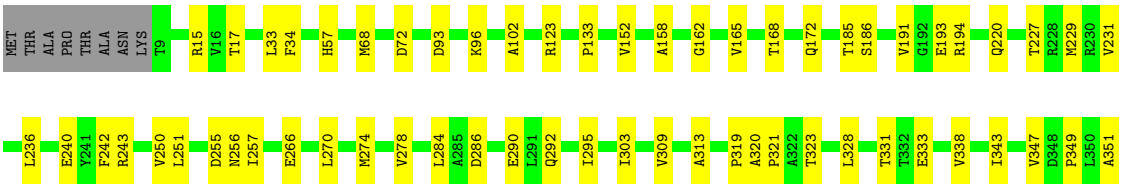
Chain D:

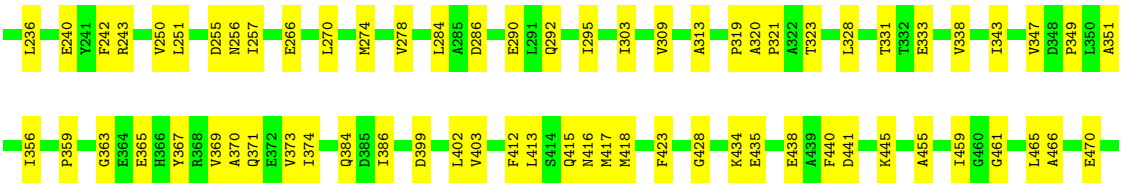


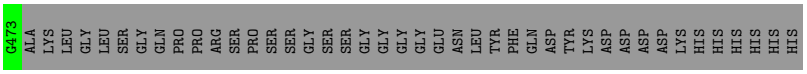


• Molecule 2: ATP synthase subunit beta

Chain E:

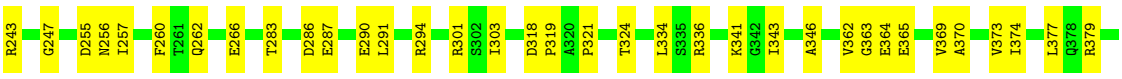


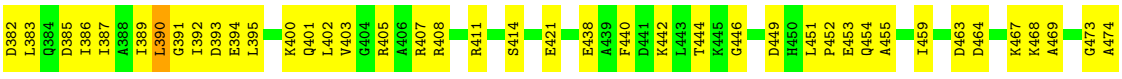


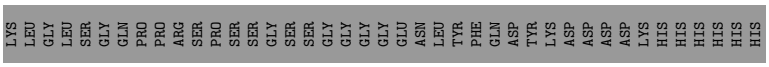


• Molecule 2: ATP synthase subunit beta

Chain F:

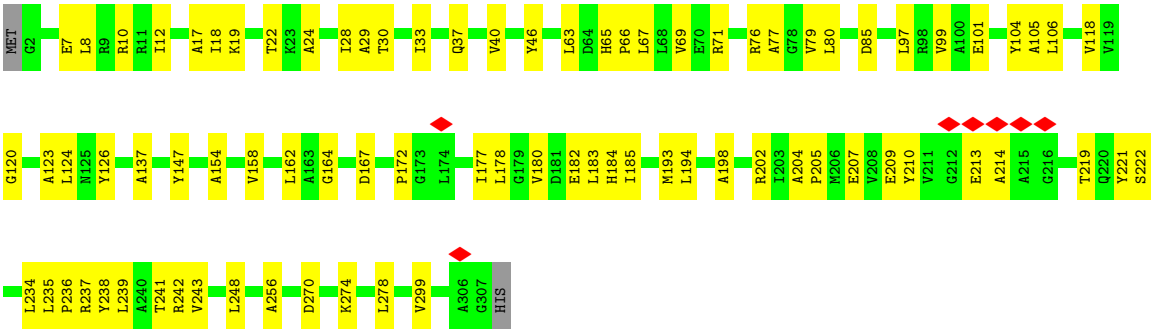






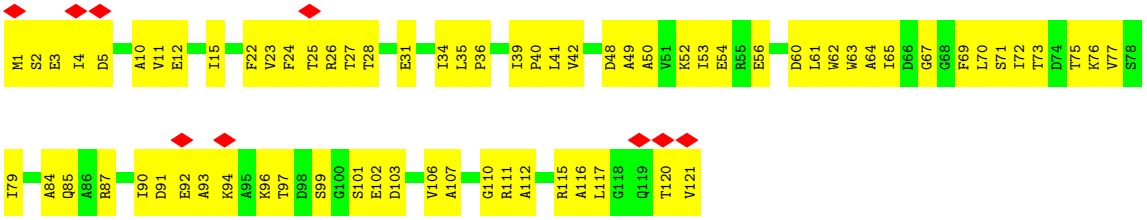
• Molecule 3: ATP synthase gamma chain

Chain G:



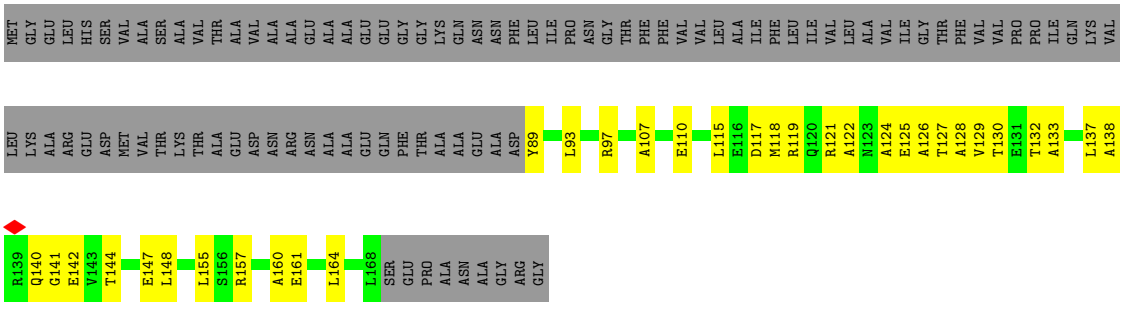
• Molecule 4: ATP synthase epsilon chain

Chain H:



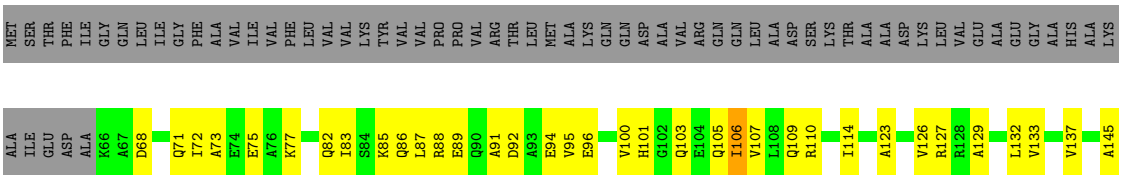
• Molecule 5: ATP synthase subunit b

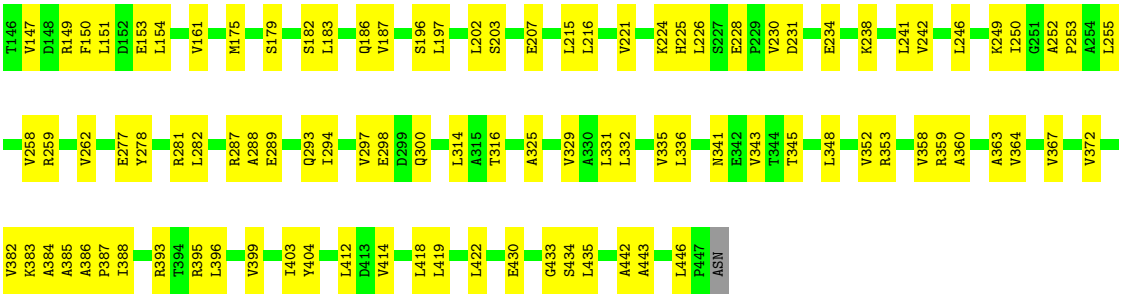
Chain b:



• Molecule 6: ATP synthase subunit b-delta

Chain d:




T146 V147 D148 R149 F150 L151 D152 E153 L154 V161 M175 S179 S182 L183 Q186 V187 S196 L197 L202 S203 E207 L215 L216 V221 K224 H225 L226 S227 E228 P229 V230 D231 E234 K238 L241 V242 L246 K249 I250 G251 A252 P253 A254 L255
V258 R259 V262 E277 Y278 R281 L282 R287 A288 E289 Q293 I294 V297 E298 D299 Q300 L314 A315 T316 A325 V329 A330 L331 L332 V335 L336 N341 E342 V343 T344 T345 L348 V352 R353 V358 R359 A360 A363 V364 V367 V372
V382 K383 A384 A385 A386 P387 I388 R393 T394 R395 L396 V399 I403 Y404 L412 D413 V414 L418 L419 L422 E430 G433 S434 L435 A442 A443 L446 P447 ASN

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	45839	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 ($e^-/Å^2$)	60	Depositor
Minimum defocus (nm)	600	Depositor
Maximum defocus (nm)	1600	Depositor
Magnification	165000	Depositor
Image detector	FEI FALCON IV (4k x 4k)	Depositor
Maximum map value	0.802	Depositor
Minimum map value	-0.337	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.020	Depositor
Recommended contour level	0.072	Depositor
Map size (Å)	516.8, 516.8, 516.8	wwPDB
Map dimensions	680, 680, 680	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.76, 0.76, 0.76	Depositor

5 Model quality

5.1 Standard geometry

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

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	0.19	0/4083	0.32	0/5540
1	B	0.16	0/4021	0.30	0/5455
1	C	0.21	0/4000	0.30	0/5429
2	D	0.13	0/3630	0.27	0/4926
2	E	0.16	0/3625	0.31	0/4920
2	F	0.21	0/3630	0.35	0/4927
3	G	0.20	0/2347	0.35	0/3182
4	H	0.44	0/933	0.64	0/1264
5	b	0.35	0/588	0.54	0/792
6	d	0.17	0/2874	0.33	0/3901
All	All	0.20	0/29731	0.33	0/40336

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

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	4021	0	4018	79	0
1	B	3959	0	3956	57	0
1	C	3938	0	3928	61	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	D	3566	0	3556	50	0
2	E	3561	0	3546	72	0
2	F	3566	0	3551	75	0
3	G	2315	0	2346	80	0
4	H	920	0	915	64	0
5	b	588	0	589	39	0
6	d	2850	0	2913	118	0
7	A	31	0	12	0	0
7	B	31	0	12	0	0
7	C	31	0	12	0	0
7	F	31	0	12	0	0
8	A	1	0	0	0	0
8	B	1	0	0	0	0
8	C	1	0	0	0	0
8	D	1	0	0	0	0
8	E	1	0	0	0	0
9	D	27	0	12	0	0
9	E	27	0	12	2	0
All	All	29467	0	29390	625	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 11.

The worst 5 of 625 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:H:27:THR:HG22	4:H:28:THR:H	1.43	0.84
4:H:103:ASP:HB3	4:H:106:VAL:HG12	1.63	0.80
4:H:52:LYS:HG3	4:H:61:LEU:O	1.86	0.76
3:G:214:ALA:HB2	1:A:542:ARG:HD2	1.71	0.73
4:H:26:ARG:HD2	4:H:50:ALA:HB3	1.71	0.73

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	527/548 (96%)	514 (98%)	13 (2%)	0	100	100
1	B	521/548 (95%)	511 (98%)	10 (2%)	0	100	100
1	C	518/548 (94%)	500 (96%)	18 (4%)	0	100	100
2	D	463/515 (90%)	454 (98%)	9 (2%)	0	100	100
2	E	463/515 (90%)	447 (96%)	16 (4%)	0	100	100
2	F	464/515 (90%)	450 (97%)	14 (3%)	0	100	100
3	G	304/308 (99%)	295 (97%)	9 (3%)	0	100	100
4	H	119/121 (98%)	107 (90%)	12 (10%)	0	100	100
5	b	78/177 (44%)	77 (99%)	1 (1%)	0	100	100
6	d	380/448 (85%)	372 (98%)	8 (2%)	0	100	100
All	All	3837/4243 (90%)	3727 (97%)	110 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	
1	A	426/440 (97%)	426 (100%)	0	100	100
1	B	421/440 (96%)	421 (100%)	0	100	100
1	C	419/440 (95%)	417 (100%)	2 (0%)	86	92
2	D	383/422 (91%)	382 (100%)	1 (0%)	91	95
2	E	382/422 (90%)	382 (100%)	0	100	100
2	F	382/422 (90%)	379 (99%)	3 (1%)	79	87
3	G	231/233 (99%)	231 (100%)	0	100	100
4	H	96/96 (100%)	96 (100%)	0	100	100
5	b	56/128 (44%)	56 (100%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
6	d	298/350 (85%)	297 (100%)	1 (0%)	91 95
All	All	3094/3393 (91%)	3087 (100%)	7 (0%)	91 96

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	F	129	ASP
2	F	180	ARG
6	d	106	ILE
2	F	390	LEU
2	D	231	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 11 such sidechains are listed below:

Mol	Chain	Res	Type
2	F	381	GLN
6	d	176	HIS
1	A	433	GLN
6	d	313	GLN
2	D	415	GLN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 11 ligands modelled in this entry, 5 are monoatomic - leaving 6 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and

the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
9	ADP	D	600	8	24,29,29	0.67	0	29,45,45	0.75	1 (3%)
9	ADP	E	600	8	24,29,29	0.67	0	29,45,45	0.83	1 (3%)
7	ATP	F	600	-	26,33,33	0.67	0	31,52,52	0.75	1 (3%)
7	ATP	A	600	8	26,33,33	0.68	0	31,52,52	0.78	1 (3%)
7	ATP	B	600	8	26,33,33	0.69	0	31,52,52	0.83	2 (6%)
7	ATP	C	600	8	26,33,33	0.66	0	31,52,52	0.76	1 (3%)

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	ADP	D	600	8	-	1/12/32/32	0/3/3/3
9	ADP	E	600	8	-	1/12/32/32	0/3/3/3
7	ATP	F	600	-	-	1/18/38/38	0/3/3/3
7	ATP	A	600	8	-	1/18/38/38	0/3/3/3
7	ATP	B	600	8	-	0/18/38/38	0/3/3/3
7	ATP	C	600	8	-	1/18/38/38	0/3/3/3

There are no bond length outliers.

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
7	B	600	ATP	C5-C6-N6	2.32	123.87	120.35
7	C	600	ATP	C5-C6-N6	2.31	123.86	120.35
7	A	600	ATP	C5-C6-N6	2.30	123.85	120.35
9	E	600	ADP	C5-C6-N6	2.29	123.83	120.35
7	F	600	ATP	C5-C6-N6	2.27	123.80	120.35

There are no chirality outliers.

All (5) torsion outliers are listed below:

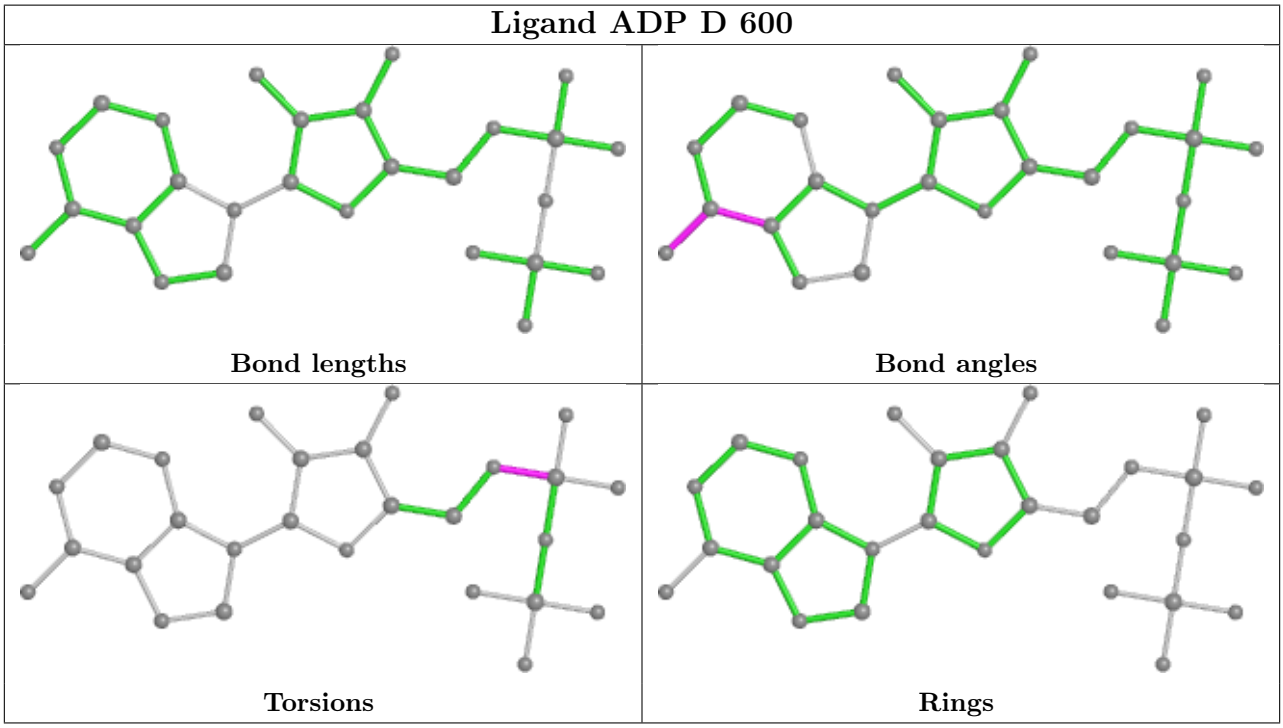
Mol	Chain	Res	Type	Atoms
7	A	600	ATP	O4'-C4'-C5'-O5'
9	D	600	ADP	C5'-O5'-PA-O1A
9	E	600	ADP	C5'-O5'-PA-O1A
7	C	600	ATP	O4'-C4'-C5'-O5'
7	F	600	ATP	O4'-C4'-C5'-O5'

There are no ring outliers.

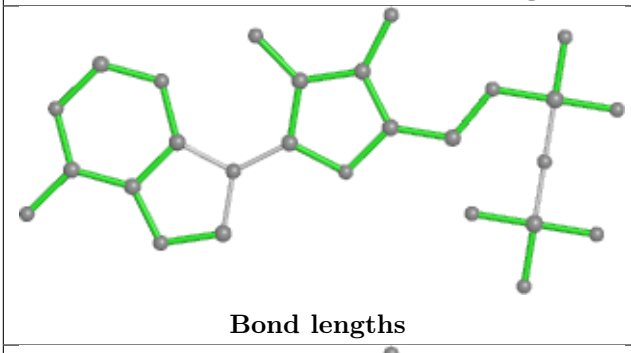
1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	E	600	ADP	2	0

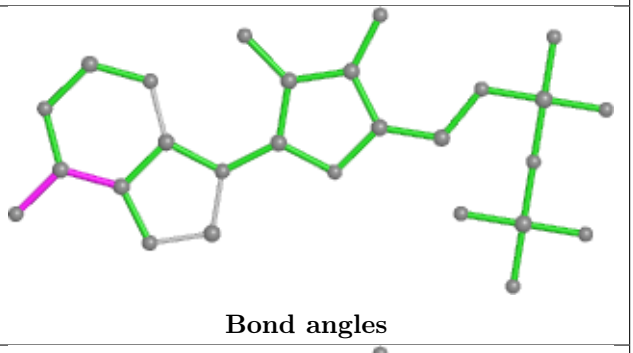
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 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.



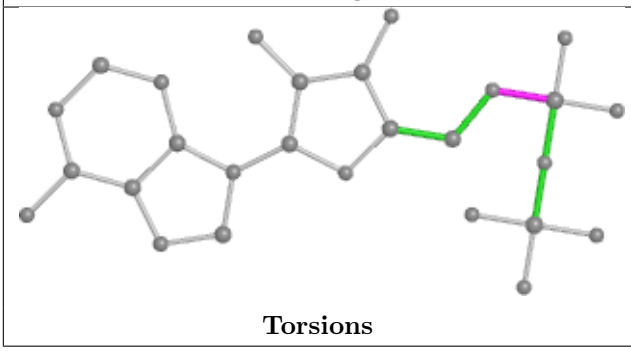
Ligand ADP E 600



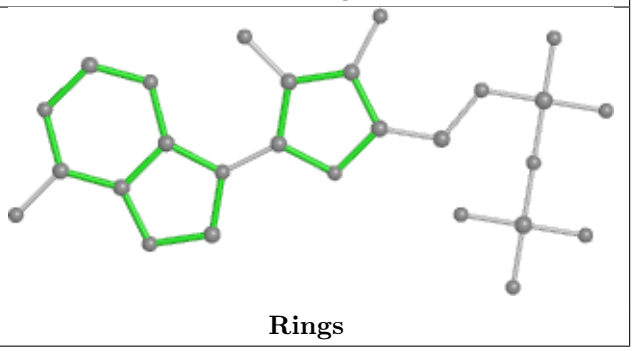
Bond lengths



Bond angles

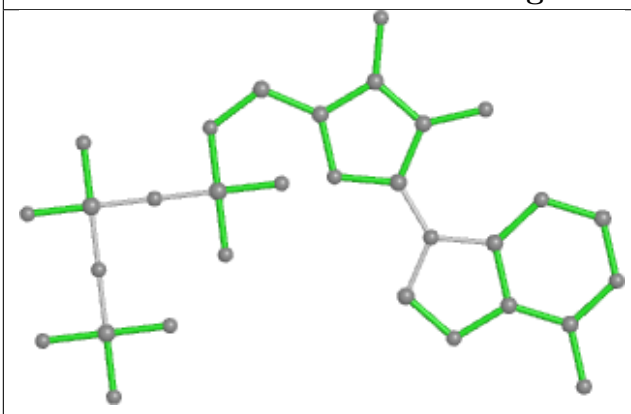


Torsions

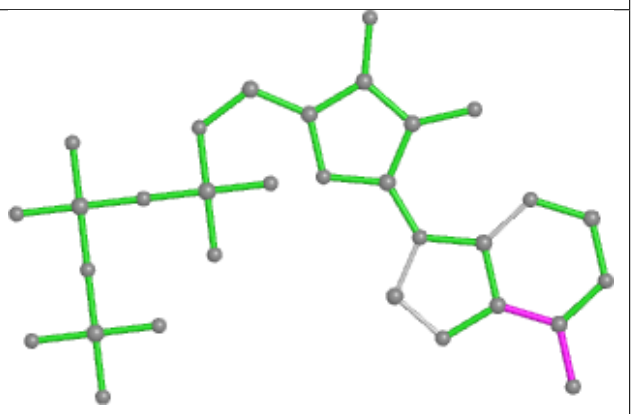


Rings

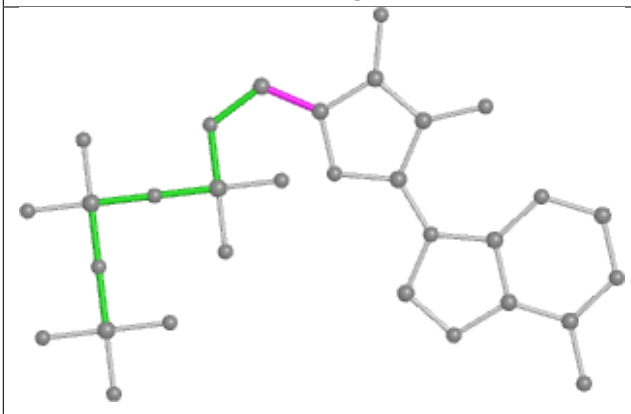
Ligand ATP F 600



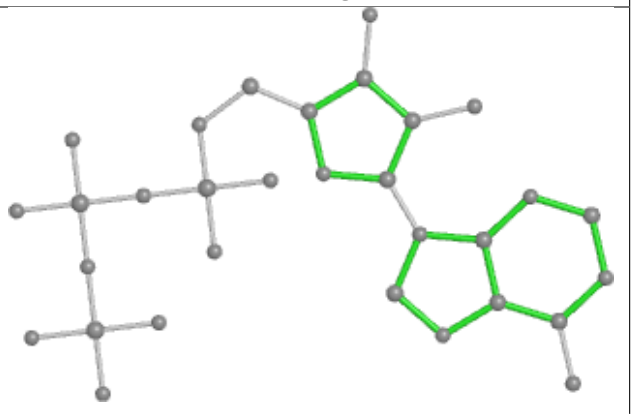
Bond lengths



Bond angles

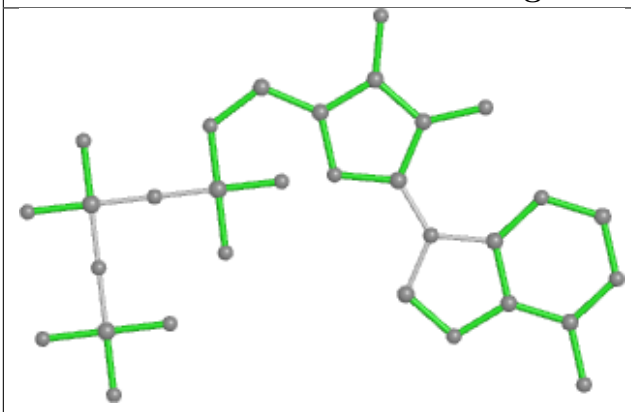


Torsions

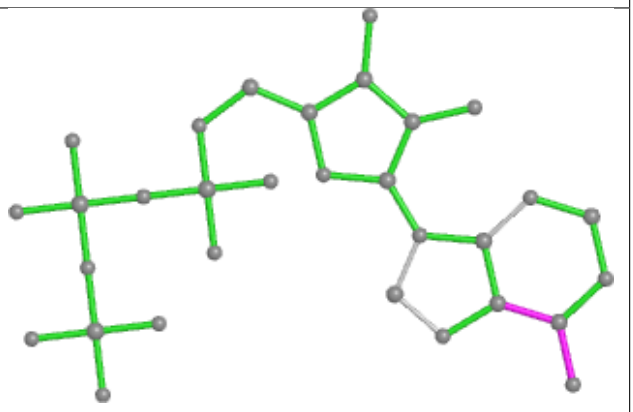


Rings

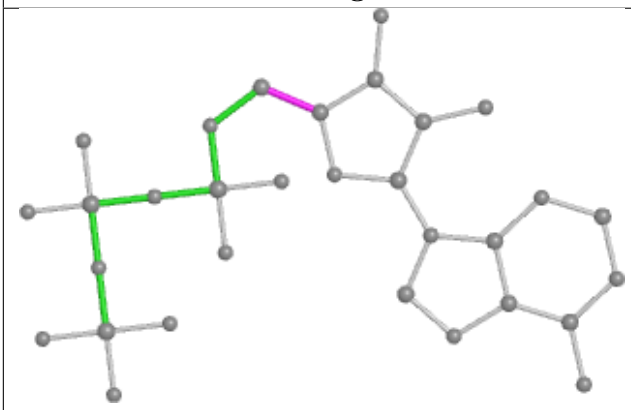
Ligand ATP A 600



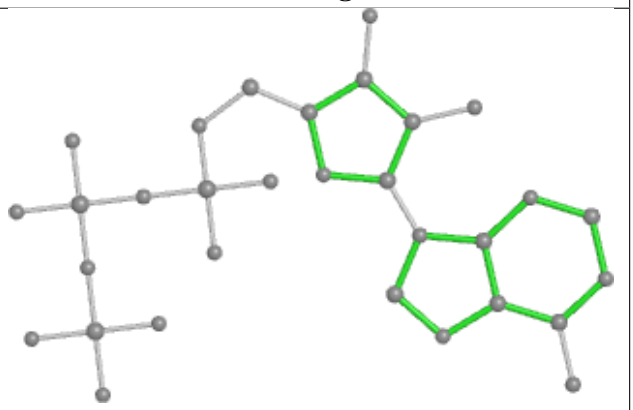
Bond lengths



Bond angles

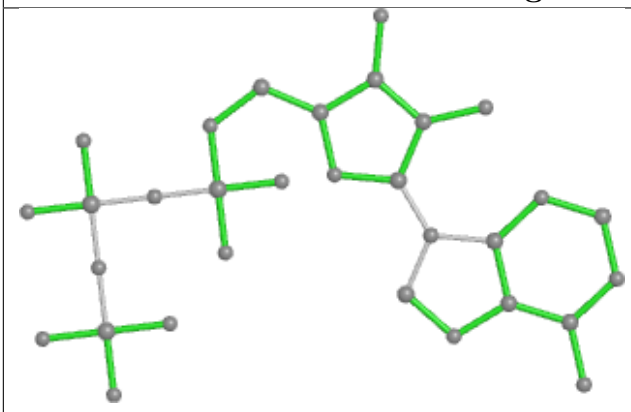


Torsions

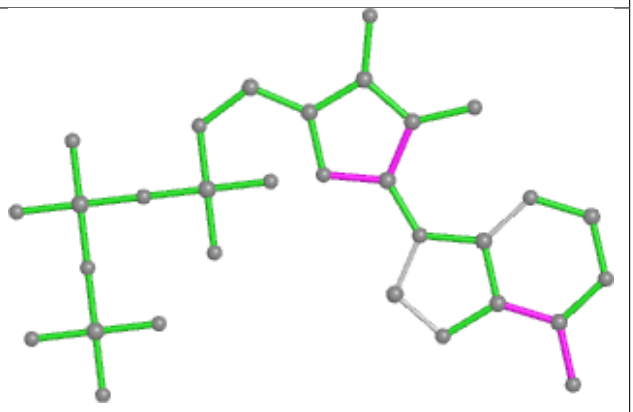


Rings

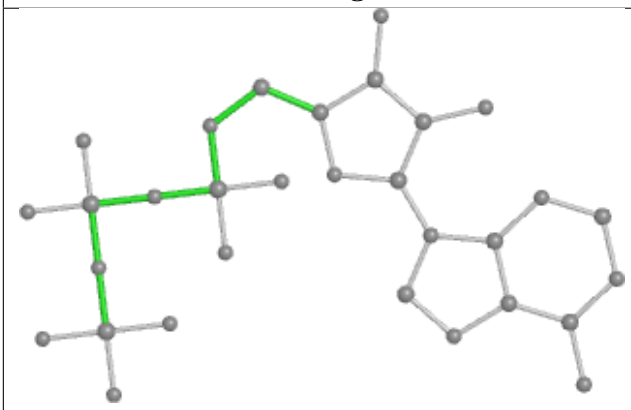
Ligand ATP B 600



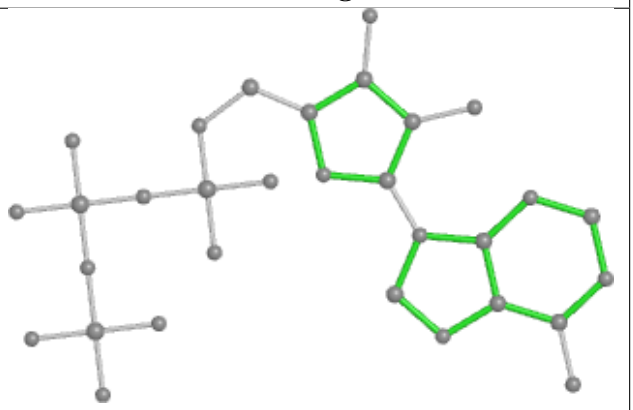
Bond lengths



Bond angles

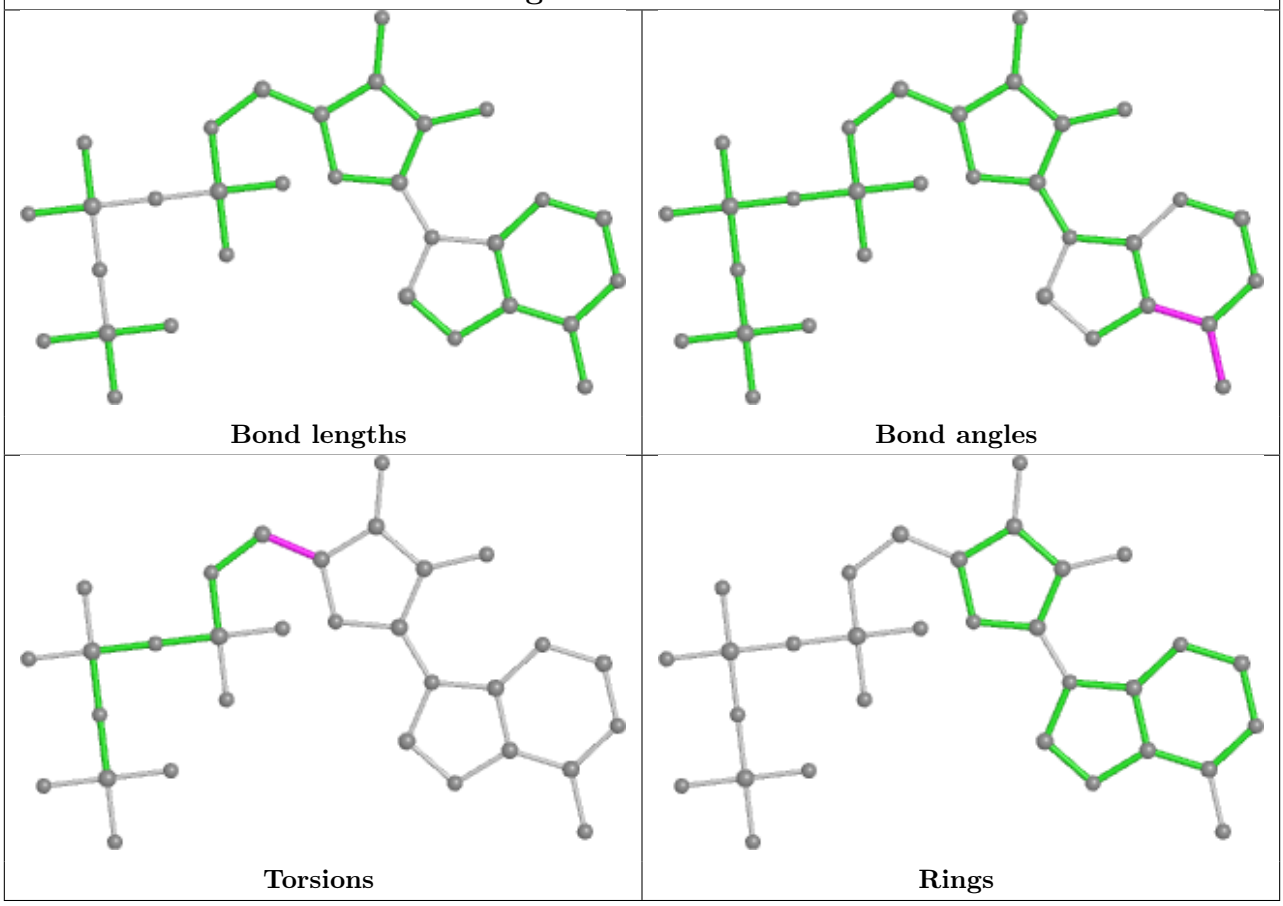


Torsions



Rings

Ligand ATP C 600



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.

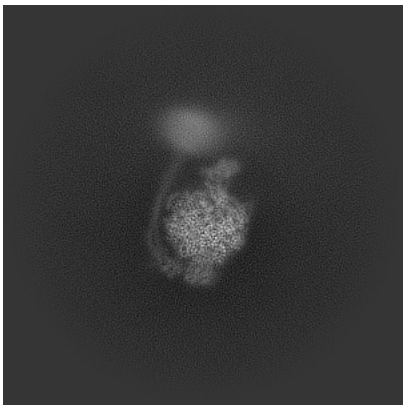
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-65138. These allow visual inspection of the internal detail of the map and identification of artifacts.

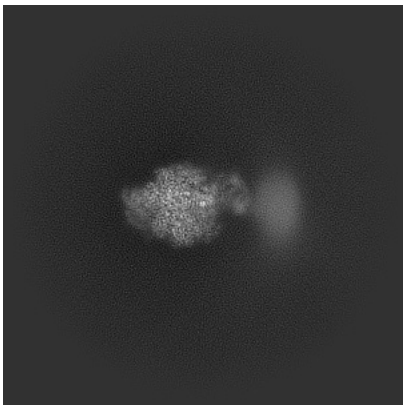
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

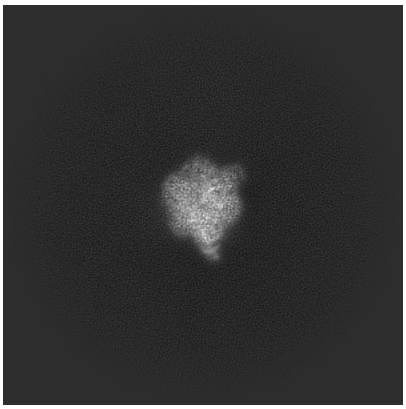
6.1.1 Primary map



X

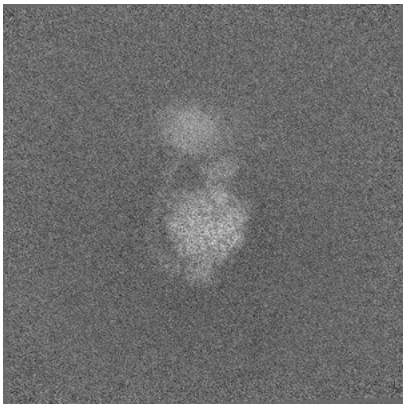


Y

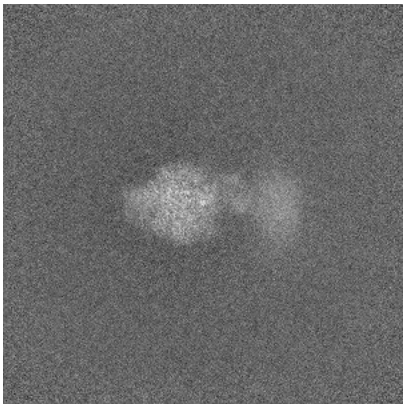


Z

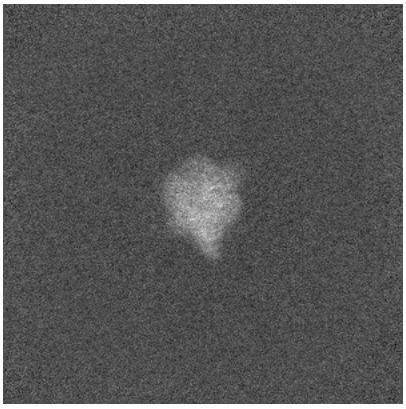
6.1.2 Raw map



X



Y

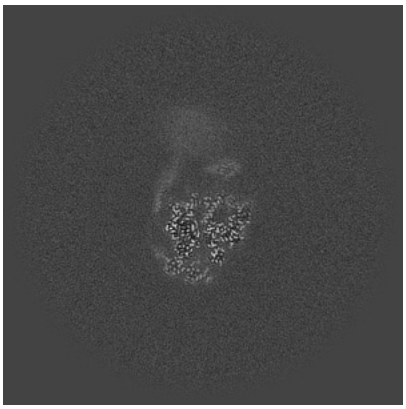


Z

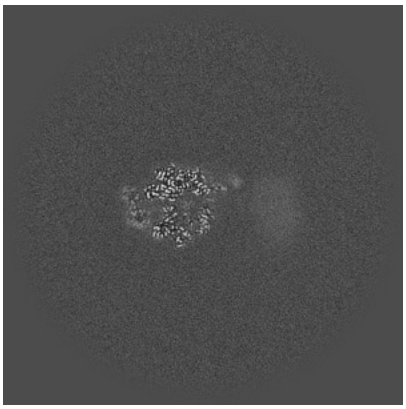
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

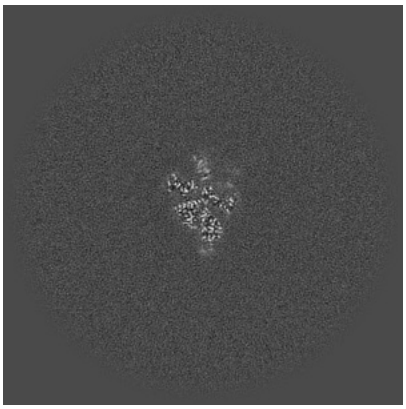
6.2.1 Primary map



X Index: 340

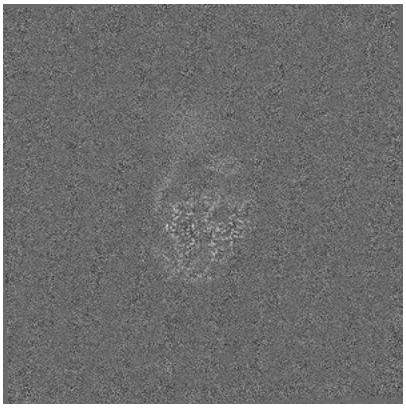


Y Index: 340

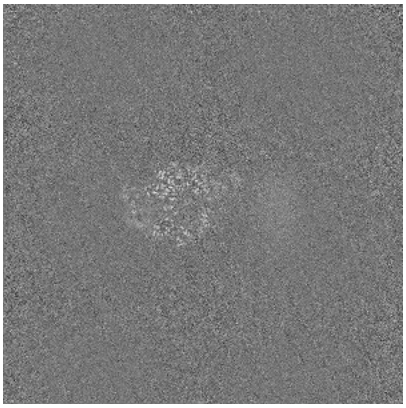


Z Index: 340

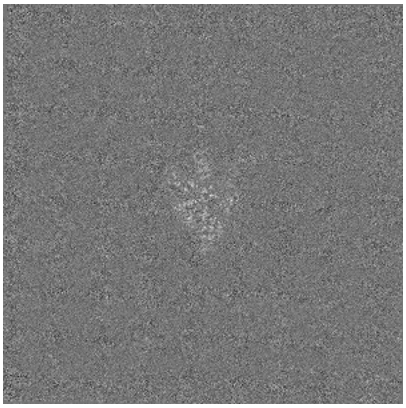
6.2.2 Raw map



X Index: 340



Y Index: 340

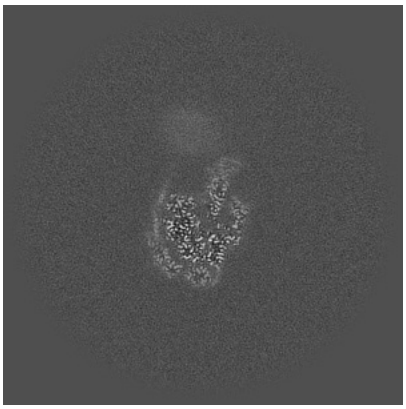


Z Index: 340

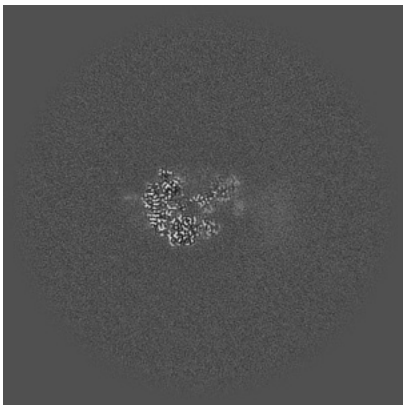
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

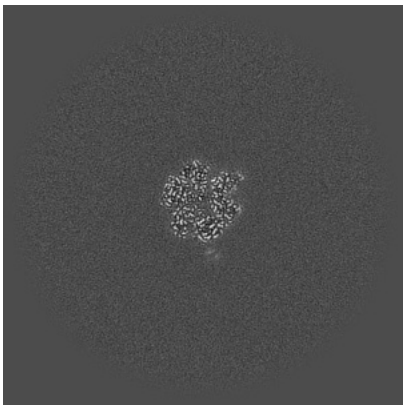
6.3.1 Primary map



X Index: 351

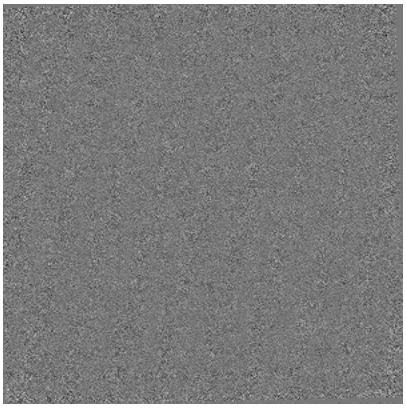


Y Index: 362

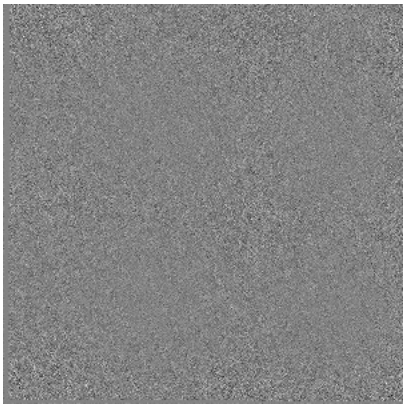


Z Index: 296

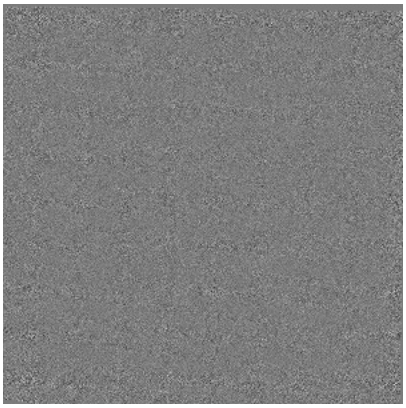
6.3.2 Raw map



X Index: 674



Y Index: 666

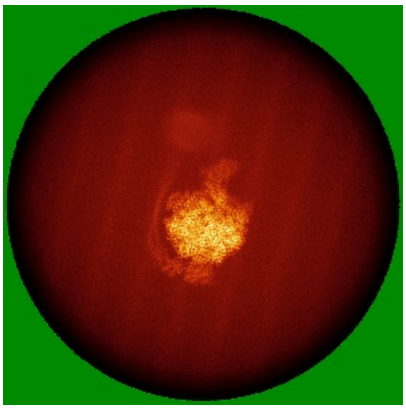


Z Index: 671

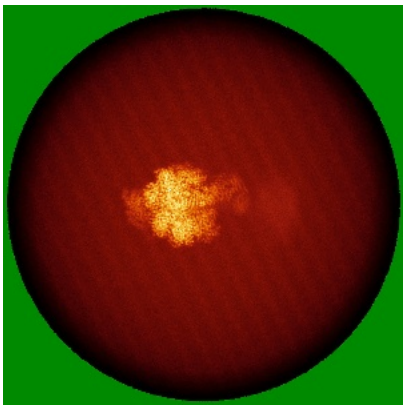
The images above show the largest variance slices of the map in three orthogonal directions.

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

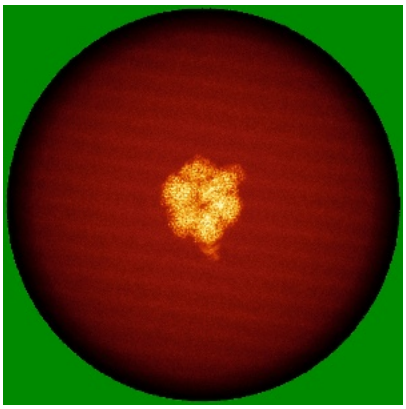
6.4.1 Primary map



X

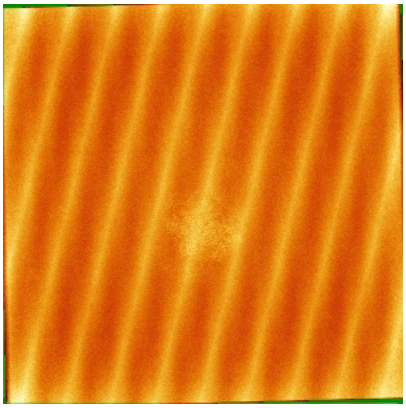


Y

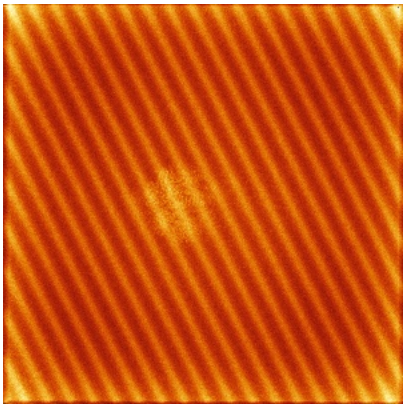


Z

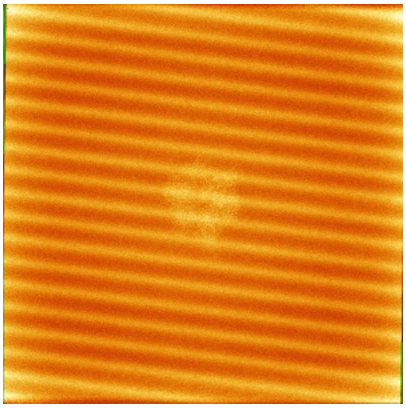
6.4.2 Raw map



X



Y

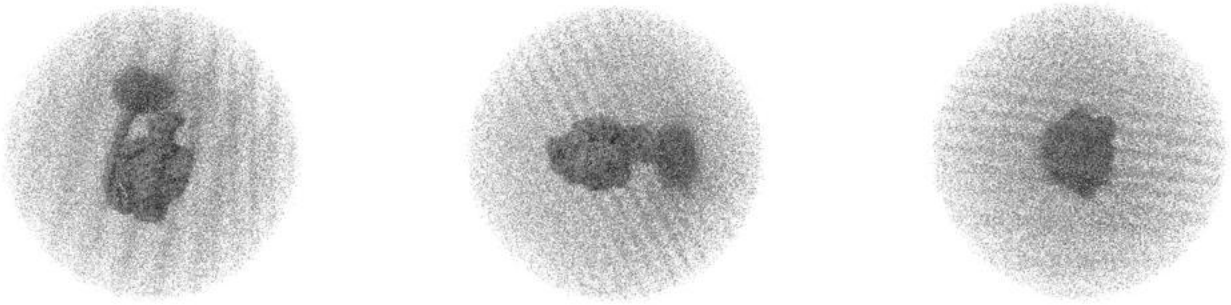


Z

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)

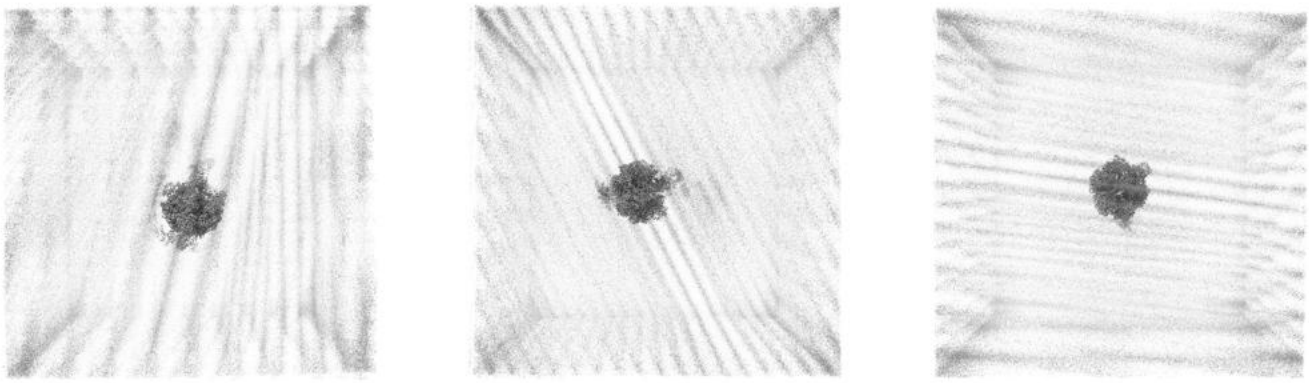
6.5.1 Primary map



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.072. 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.

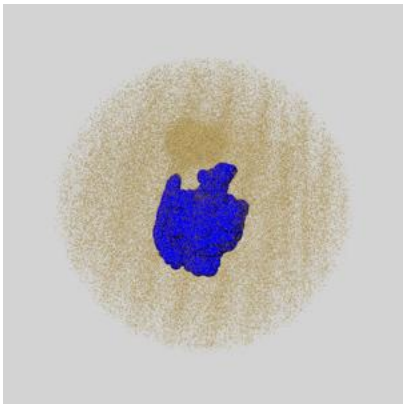
6.6 Mask visualisation

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

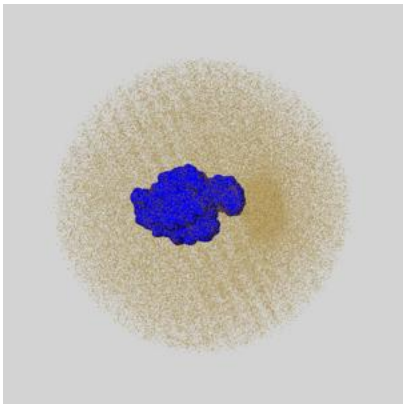
A mask typically either:

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

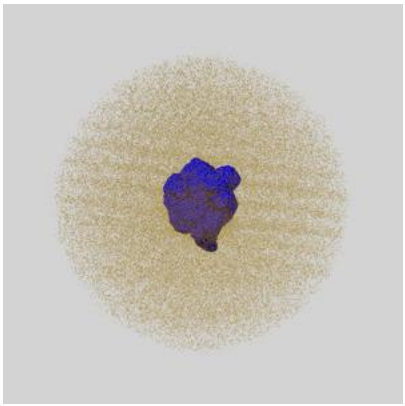
6.6.1 emd_65138_msk_1.map



X



Y

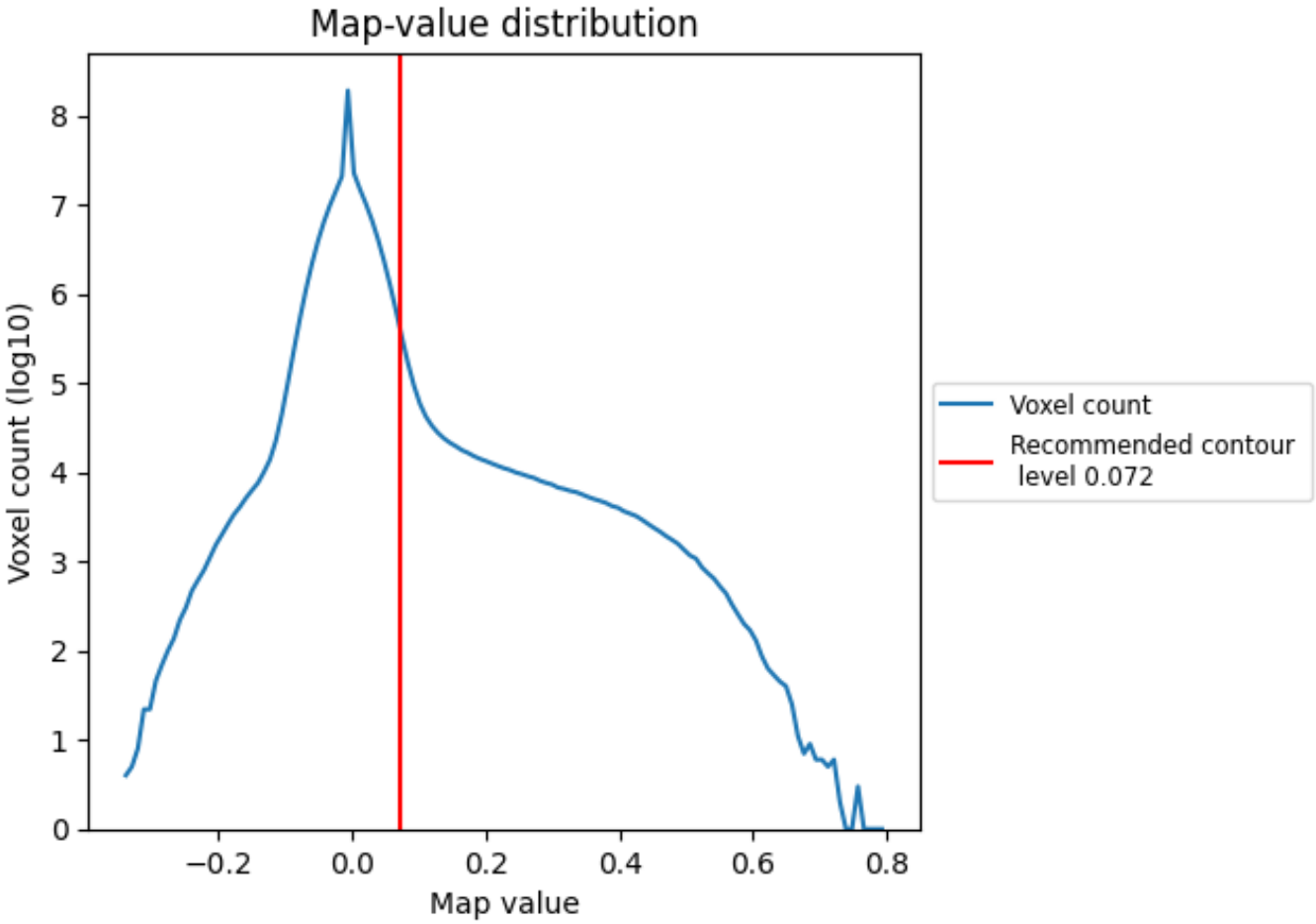


Z

7 Map analysis

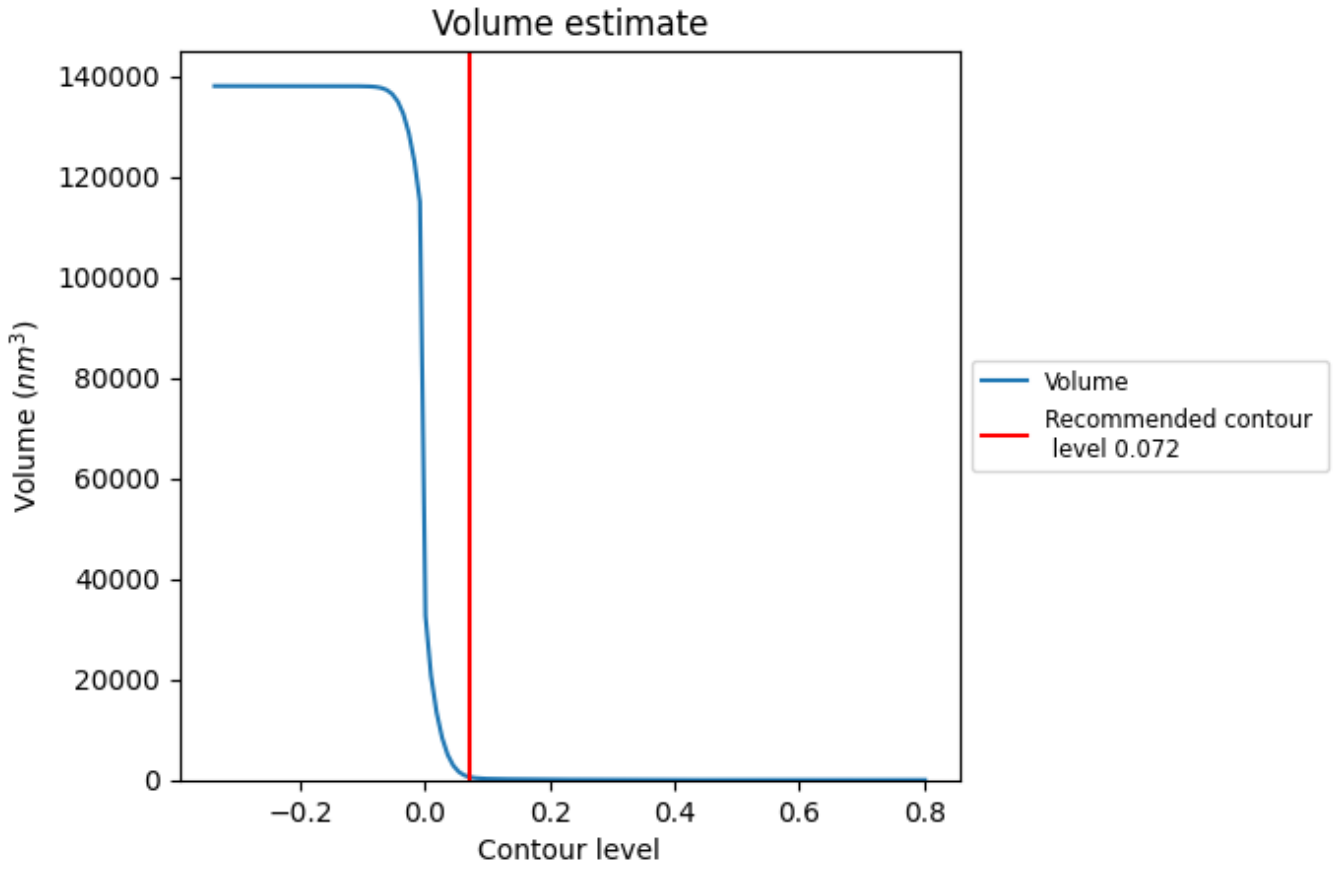
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution



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.

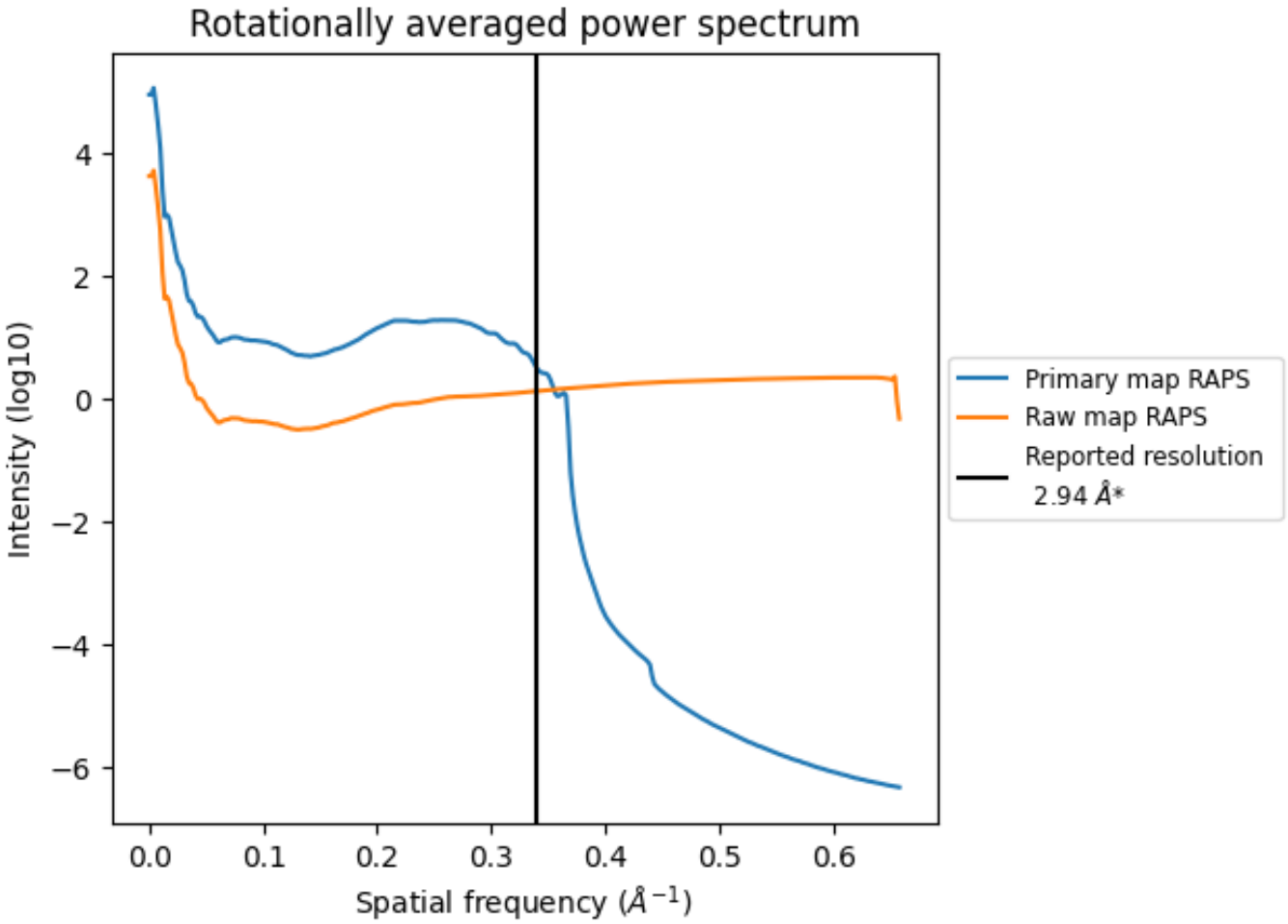
7.2 Volume estimate



The volume at the recommended contour level is 560 nm^3; this corresponds to an approximate mass of 506 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)

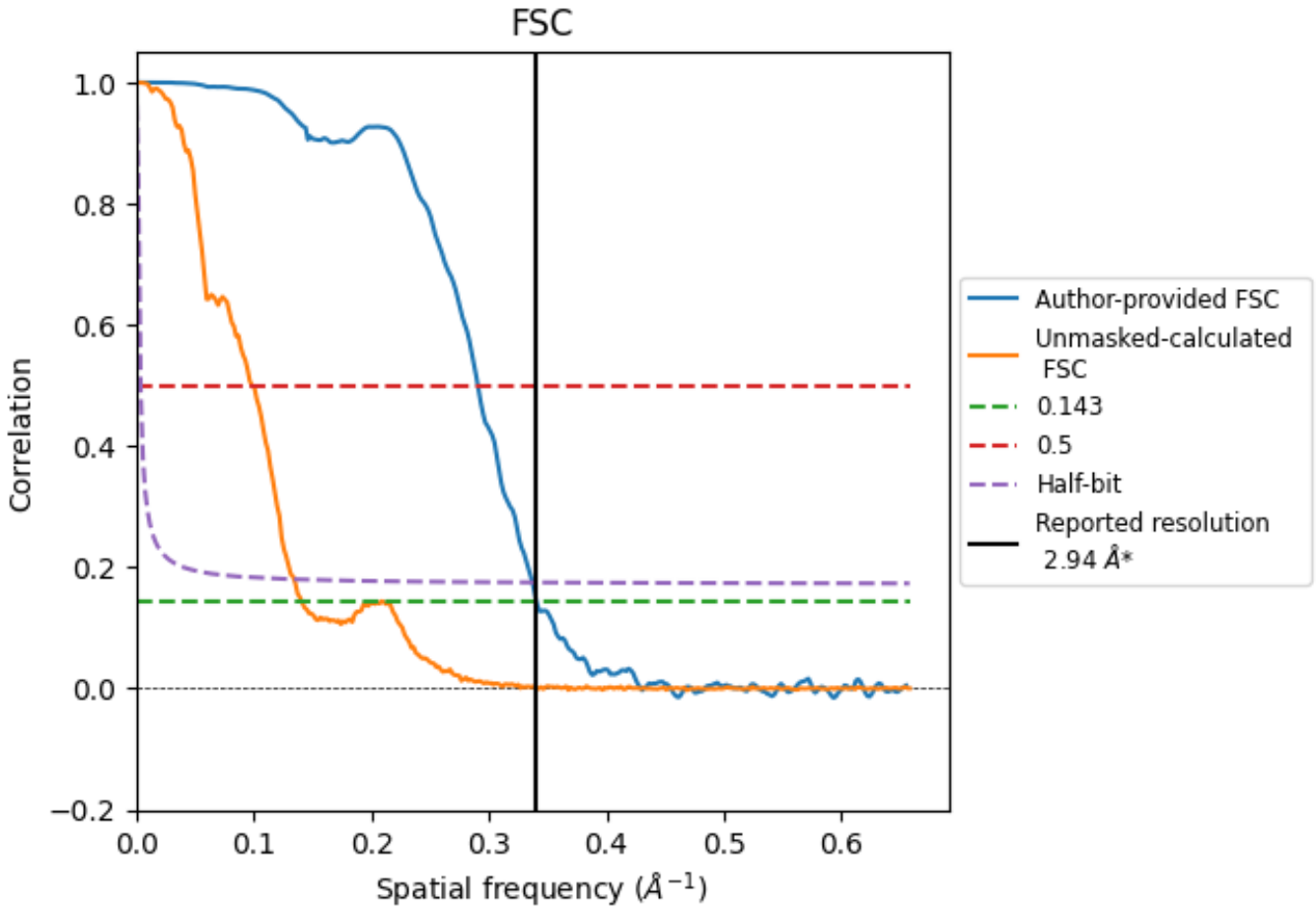


*Reported resolution corresponds to spatial frequency of 0.340 Å^{-1}

8 Fourier-Shell correlation

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



*Reported resolution corresponds to spatial frequency of 0.340 Å^{-1}

8.2 Resolution estimates (i)

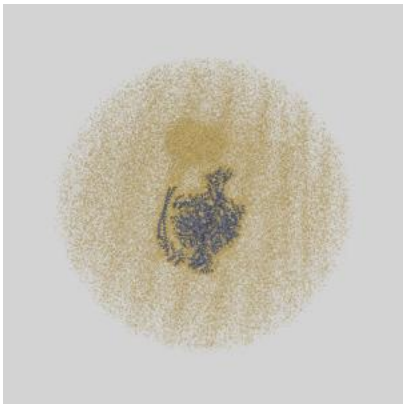
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.94	-	-
Author-provided FSC curve	2.94	3.44	2.97
Unmasked-calculated*	7.10	10.15	7.45

*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 7.10 differs from the reported value 2.94 by more than 10 %

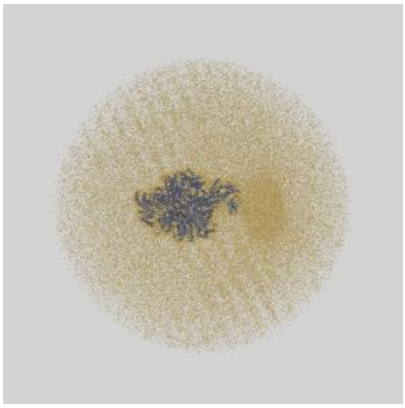
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-65138 and PDB model 9VKP. Per-residue inclusion information can be found in section 3 on page 10.

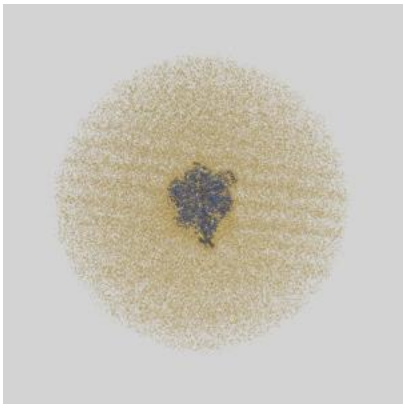
9.1 Map-model overlay



X



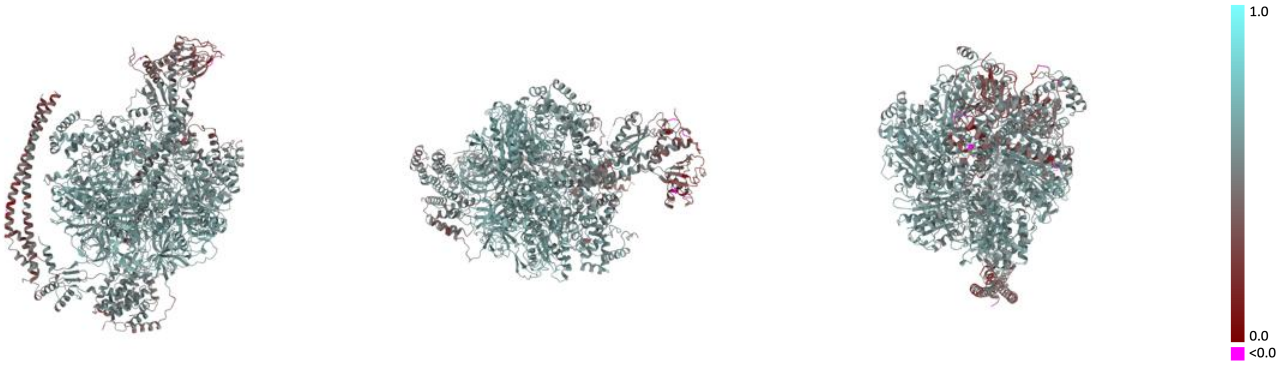
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.072 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.

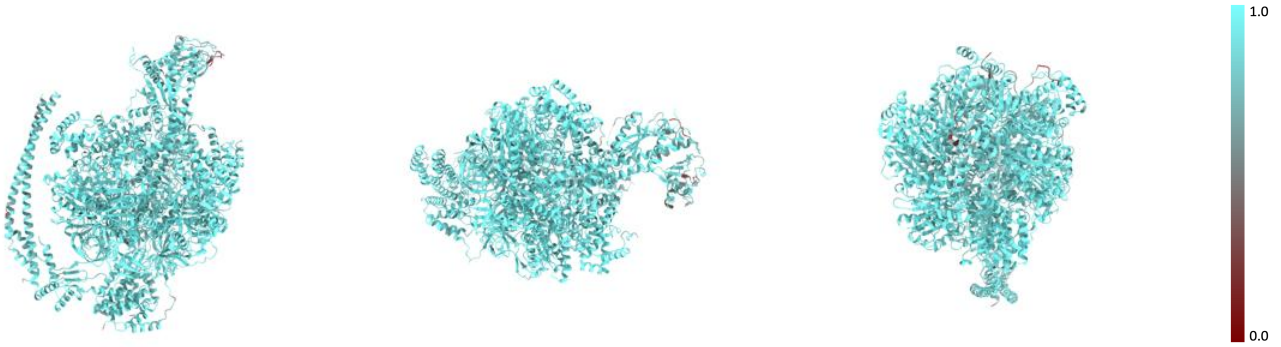
9.2 Q-score mapped to coordinate model (i)



X Y Z

The images above show the model with each residue coloured according 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.

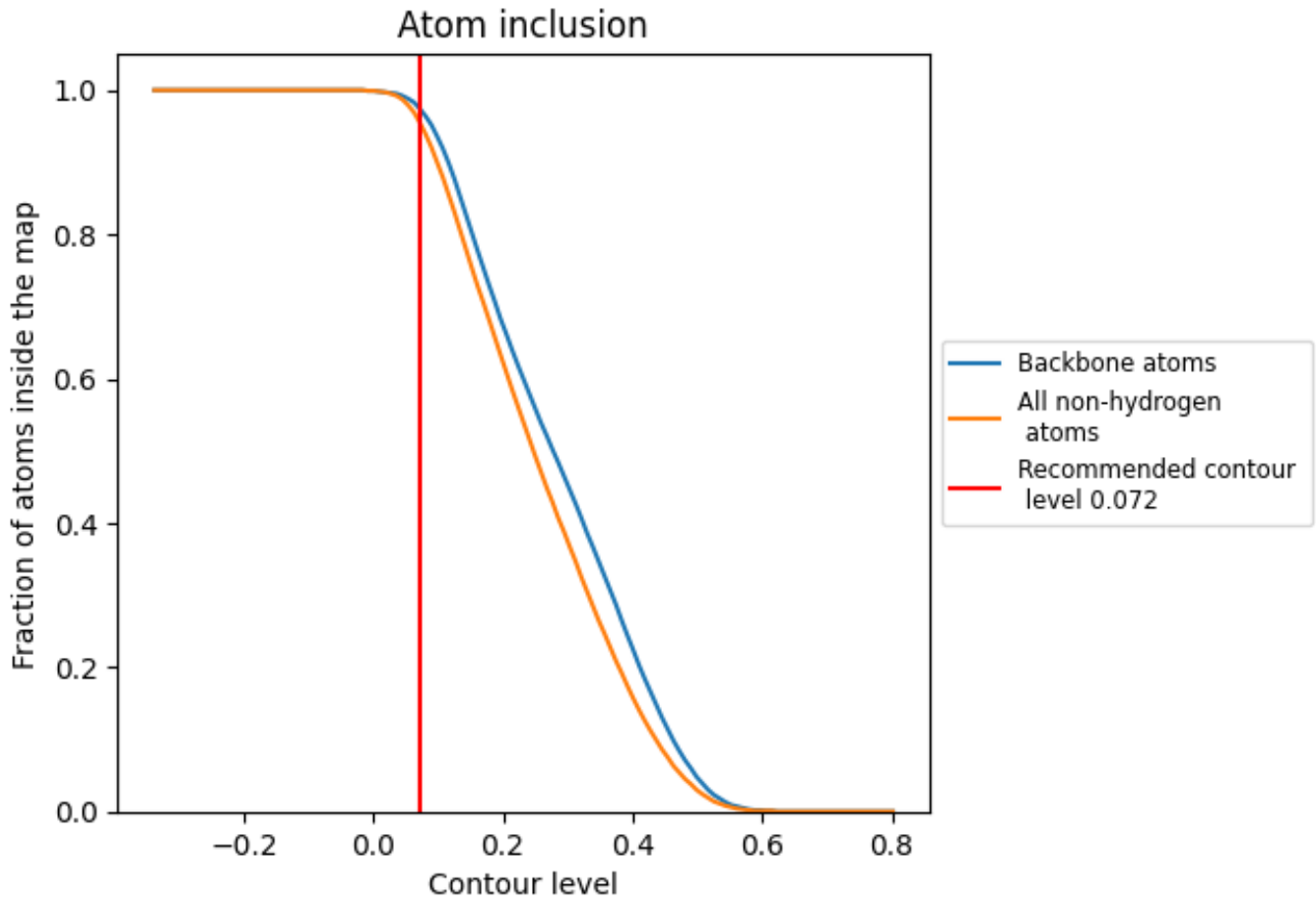
9.3 Atom inclusion mapped to coordinate model (i)



X Y Z

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 (0.072).

9.4 Atom inclusion (i)



At the recommended contour level, 97% of all backbone atoms, 96% 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 (0.072) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.9550	0.5580
A	0.9690	0.5820
B	0.9710	0.5900
C	0.9680	0.5840
D	0.9840	0.6080
E	0.9790	0.5910
F	0.9730	0.5830
G	0.8970	0.4740
H	0.7620	0.3010
b	0.8330	0.3720
d	0.9370	0.5000