



wwPDB EM Validation Summary Report ⓘ

Sep 30, 2025 – 02:29 pm BST

PDB ID : 9QFE / pdb_00009qfe
EMDB ID : EMD-53107
Title : Cryo-EM structure of the actin filament hetero-decorated by Coronin-1 and Cofilin-1 on separate actin strands
Authors : Oosterheert, W.; Boiero Sanders, M.; Hofnagel, O.; Bieling, P.; Raunser, S.
Deposited on : 2025-03-11
Resolution : 3.12 Å(reported)
Based on initial model : 9QF2

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 ⓘ 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:

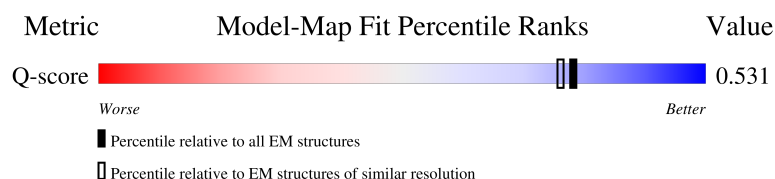
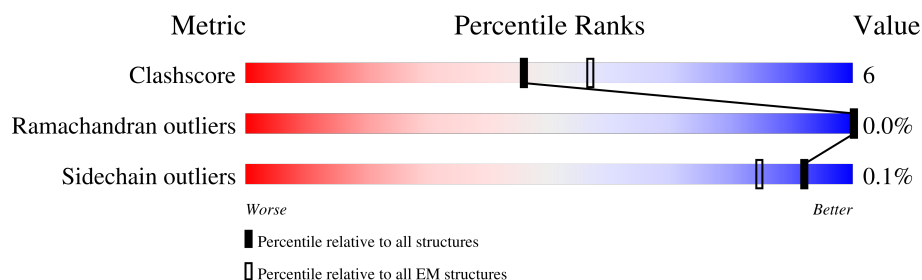
EMDB validation analysis : 0.0.1.dev129
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4-5-2 with Phenix2.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up 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) : 2.46

1 Overall quality at a glance

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

The reported resolution of this entry is 3.12 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.





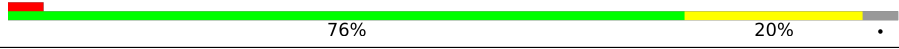



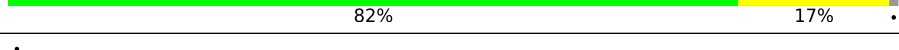
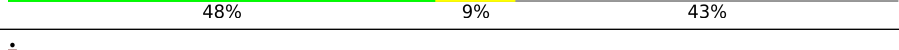
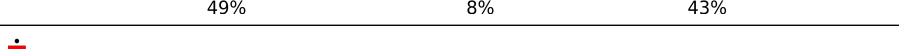
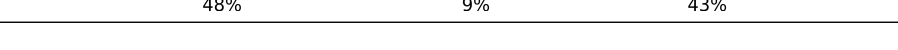
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
Q-score	-	25397	14478 (2.62 - 3.62)

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	374	
1	B	374	
1	C	374	
1	D	374	

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Mol	Chain	Length	Quality of chain
1	E	374	
1	F	374	
1	G	374	
2	H	166	
2	I	166	
2	J	166	
2	K	166	
3	L	688	
3	M	688	
3	N	688	

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 34422 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Actin, cytoplasmic 1, N-terminally processed.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	359	Total	C	N	O	S	0	0
			2806	1780	470	537	19		
1	B	366	Total	C	N	O	S	0	0
			2860	1814	481	545	20		
1	C	359	Total	C	N	O	S	0	0
			2806	1780	470	537	19		
1	D	366	Total	C	N	O	S	0	0
			2860	1814	481	545	20		
1	E	359	Total	C	N	O	S	0	0
			2806	1780	470	537	19		
1	F	366	Total	C	N	O	S	0	0
			2860	1814	481	545	20		
1	G	359	Total	C	N	O	S	0	0
			2806	1780	470	537	19		

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	272	ALA	CYS	engineered mutation	UNP P60709
B	272	ALA	CYS	engineered mutation	UNP P60709
C	272	ALA	CYS	engineered mutation	UNP P60709
D	272	ALA	CYS	engineered mutation	UNP P60709
E	272	ALA	CYS	engineered mutation	UNP P60709
F	272	ALA	CYS	engineered mutation	UNP P60709
G	272	ALA	CYS	engineered mutation	UNP P60709

- Molecule 2 is a protein called Cofilin-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	H	165	Total	C	N	O	S	0	0
			1288	821	210	250	7		
2	I	165	Total	C	N	O	S	0	0
			1288	821	210	250	7		

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Mol	Chain	Residues	Atoms					AltConf	Trace
2	J	165	Total	C	N	O	S	0	0
			1288	821	210	250	7		
2	K	165	Total	C	N	O	S	0	0
			1288	821	210	250	7		

- Molecule 3 is a protein called Coronin-1B,Methylated-DNA--protein-cysteine methyltransferase.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	L	393	Total	C	N	O	S	0	0
			3090	1958	532	582	18		
3	M	393	Total	C	N	O	S	0	0
			3090	1958	532	582	18		
3	N	393	Total	C	N	O	S	0	0
			3090	1958	532	582	18		

There are 84 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
L	-4	GLY	-	expression tag	UNP Q9BR76
L	-3	ALA	-	expression tag	UNP Q9BR76
L	-2	MET	-	expression tag	UNP Q9BR76
L	-1	GLY	-	expression tag	UNP Q9BR76
L	0	SER	-	expression tag	UNP Q9BR76
L	490	GLY	-	linker	UNP Q9BR76
L	491	THR	-	linker	UNP Q9BR76
L	492	GLY	-	linker	UNP Q9BR76
L	493	GLY	-	linker	UNP Q9BR76
L	494	GLY	-	linker	UNP Q9BR76
L	495	GLY	-	linker	UNP Q9BR76
L	496	SER	-	linker	UNP Q9BR76
L	497	GLY	-	linker	UNP Q9BR76
L	498	GLY	-	linker	UNP Q9BR76
L	499	GLY	-	linker	UNP Q9BR76
L	500	GLY	-	linker	UNP Q9BR76
L	501	SER	-	linker	UNP Q9BR76
L	563	ALA	CYS	conflict	UNP P16455
L	626	ALA	LYS	conflict	UNP P16455
L	628	THR	ALA	conflict	UNP P16455
L	629	ALA	ARG	conflict	UNP P16455
L	632	LYS	GLY	conflict	UNP P16455
L	633	THR	GLY	conflict	UNP P16455

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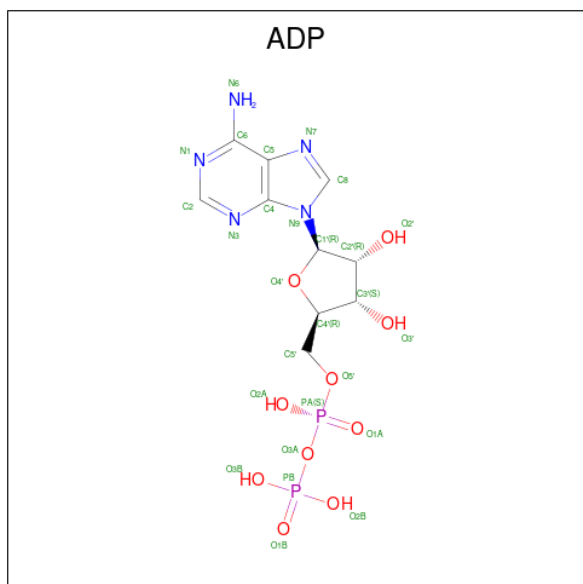
Chain	Residue	Modelled	Actual	Comment	Reference
L	635	LEU	MET	conflict	UNP P16455
L	636	SER	ARG	conflict	UNP P16455
L	651	SER	CYS	conflict	UNP P16455
L	658	GLY	ASN	conflict	UNP P16455
L	660	GLU	SER	conflict	UNP P16455
M	-4	GLY	-	expression tag	UNP Q9BR76
M	-3	ALA	-	expression tag	UNP Q9BR76
M	-2	MET	-	expression tag	UNP Q9BR76
M	-1	GLY	-	expression tag	UNP Q9BR76
M	0	SER	-	expression tag	UNP Q9BR76
M	490	GLY	-	linker	UNP Q9BR76
M	491	THR	-	linker	UNP Q9BR76
M	492	GLY	-	linker	UNP Q9BR76
M	493	GLY	-	linker	UNP Q9BR76
M	494	GLY	-	linker	UNP Q9BR76
M	495	GLY	-	linker	UNP Q9BR76
M	496	SER	-	linker	UNP Q9BR76
M	497	GLY	-	linker	UNP Q9BR76
M	498	GLY	-	linker	UNP Q9BR76
M	499	GLY	-	linker	UNP Q9BR76
M	500	GLY	-	linker	UNP Q9BR76
M	501	SER	-	linker	UNP Q9BR76
M	563	ALA	CYS	conflict	UNP P16455
M	626	ALA	LYS	conflict	UNP P16455
M	628	THR	ALA	conflict	UNP P16455
M	629	ALA	ARG	conflict	UNP P16455
M	632	LYS	GLY	conflict	UNP P16455
M	633	THR	GLY	conflict	UNP P16455
M	635	LEU	MET	conflict	UNP P16455
M	636	SER	ARG	conflict	UNP P16455
M	651	SER	CYS	conflict	UNP P16455
M	658	GLY	ASN	conflict	UNP P16455
M	660	GLU	SER	conflict	UNP P16455
N	-4	GLY	-	expression tag	UNP Q9BR76
N	-3	ALA	-	expression tag	UNP Q9BR76
N	-2	MET	-	expression tag	UNP Q9BR76
N	-1	GLY	-	expression tag	UNP Q9BR76
N	0	SER	-	expression tag	UNP Q9BR76
N	490	GLY	-	linker	UNP Q9BR76
N	491	THR	-	linker	UNP Q9BR76
N	492	GLY	-	linker	UNP Q9BR76
N	493	GLY	-	linker	UNP Q9BR76

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Chain	Residue	Modelled	Actual	Comment	Reference
N	494	GLY	-	linker	UNP Q9BR76
N	495	GLY	-	linker	UNP Q9BR76
N	496	SER	-	linker	UNP Q9BR76
N	497	GLY	-	linker	UNP Q9BR76
N	498	GLY	-	linker	UNP Q9BR76
N	499	GLY	-	linker	UNP Q9BR76
N	500	GLY	-	linker	UNP Q9BR76
N	501	SER	-	linker	UNP Q9BR76
N	563	ALA	CYS	conflict	UNP P16455
N	626	ALA	LYS	conflict	UNP P16455
N	628	THR	ALA	conflict	UNP P16455
N	629	ALA	ARG	conflict	UNP P16455
N	632	LYS	GLY	conflict	UNP P16455
N	633	THR	GLY	conflict	UNP P16455
N	635	LEU	MET	conflict	UNP P16455
N	636	SER	ARG	conflict	UNP P16455
N	651	SER	CYS	conflict	UNP P16455
N	658	GLY	ASN	conflict	UNP P16455
N	660	GLU	SER	conflict	UNP P16455

- Molecule 4 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
4	A	1	Total	C	N	O	P	0
			27	10	5	10	2	

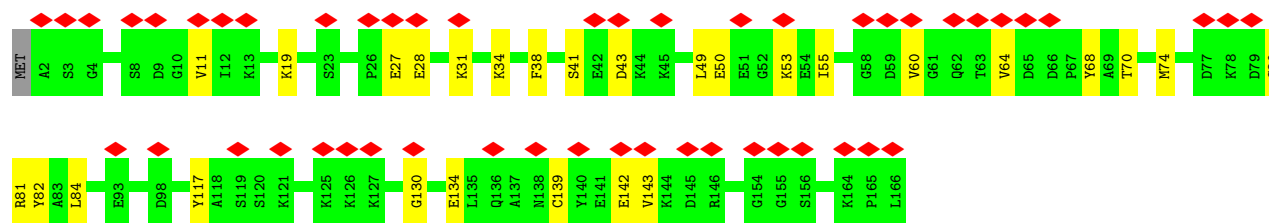
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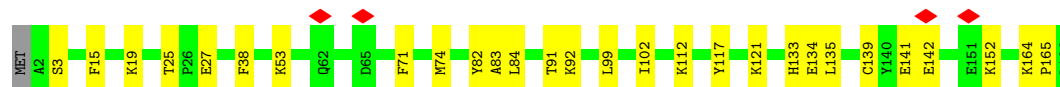
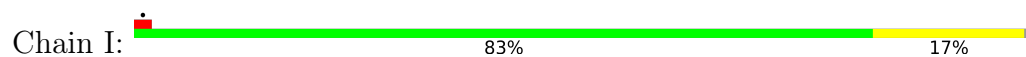
Mol	Chain	Residues	Atoms					AltConf
4	B	1	Total	C	N	O	P	0
			27	10	5	10	2	
4	C	1	Total	C	N	O	P	0
			27	10	5	10	2	
4	D	1	Total	C	N	O	P	0
			27	10	5	10	2	
4	E	1	Total	C	N	O	P	0
			27	10	5	10	2	
4	F	1	Total	C	N	O	P	0
			27	10	5	10	2	
4	G	1	Total	C	N	O	P	0
			27	10	5	10	2	

- Molecule 5 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

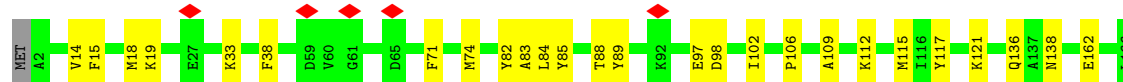
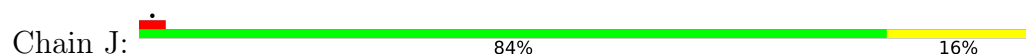
Mol	Chain	Residues	Atoms		AltConf
5	A	1	Total	Mg	0
			1	1	
5	B	1	Total	Mg	0
			1	1	
5	C	1	Total	Mg	0
			1	1	
5	D	1	Total	Mg	0
			1	1	
5	E	1	Total	Mg	0
			1	1	
5	F	1	Total	Mg	0
			1	1	
5	G	1	Total	Mg	0
			1	1	



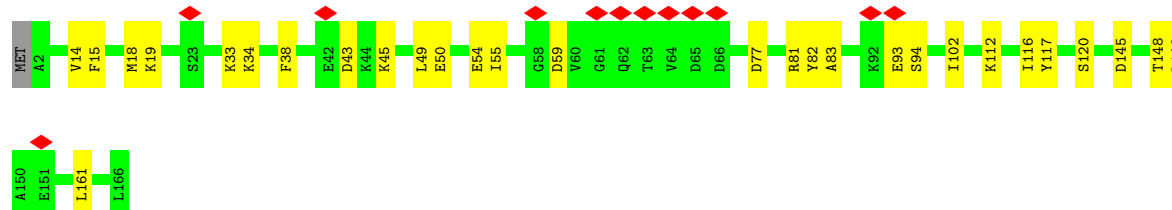
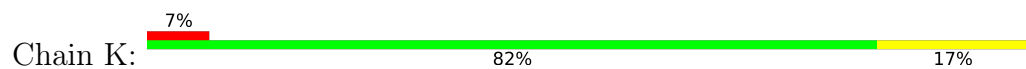
- Molecule 2: Cofilin-1



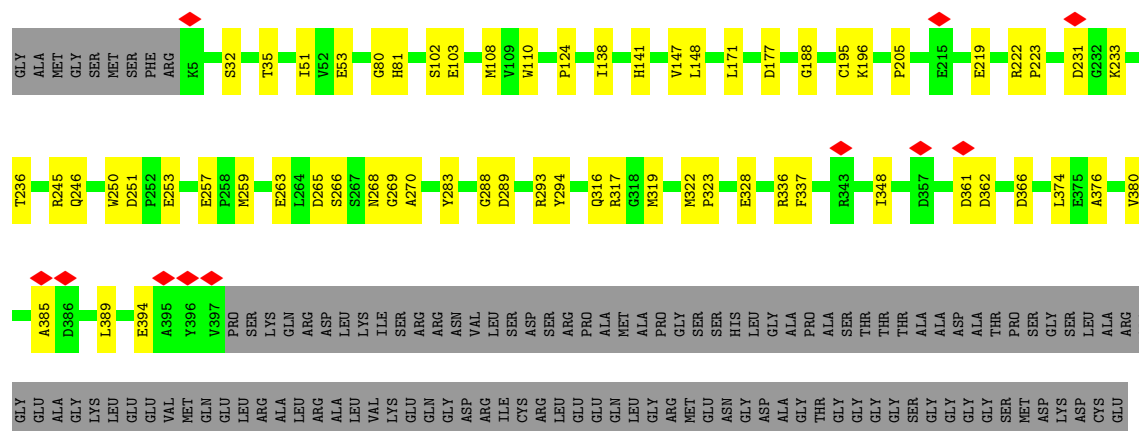
- Molecule 2: Cofilin-1



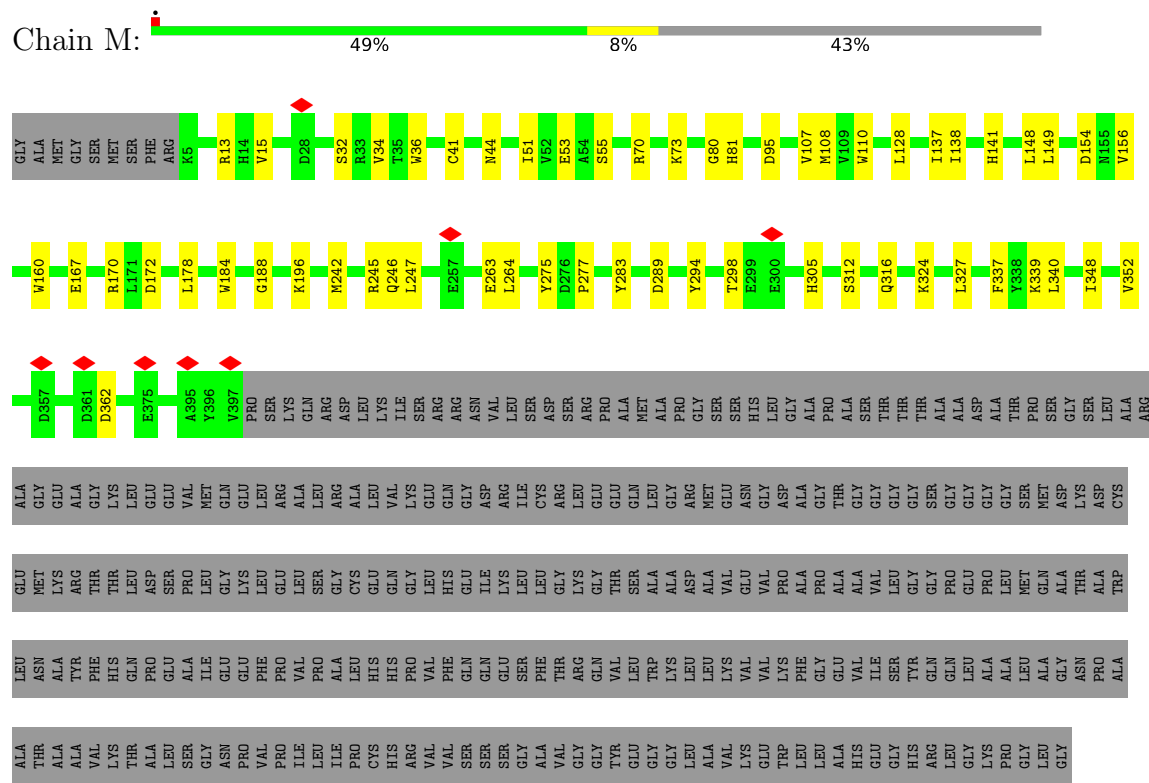
- Molecule 2: Cofilin-1



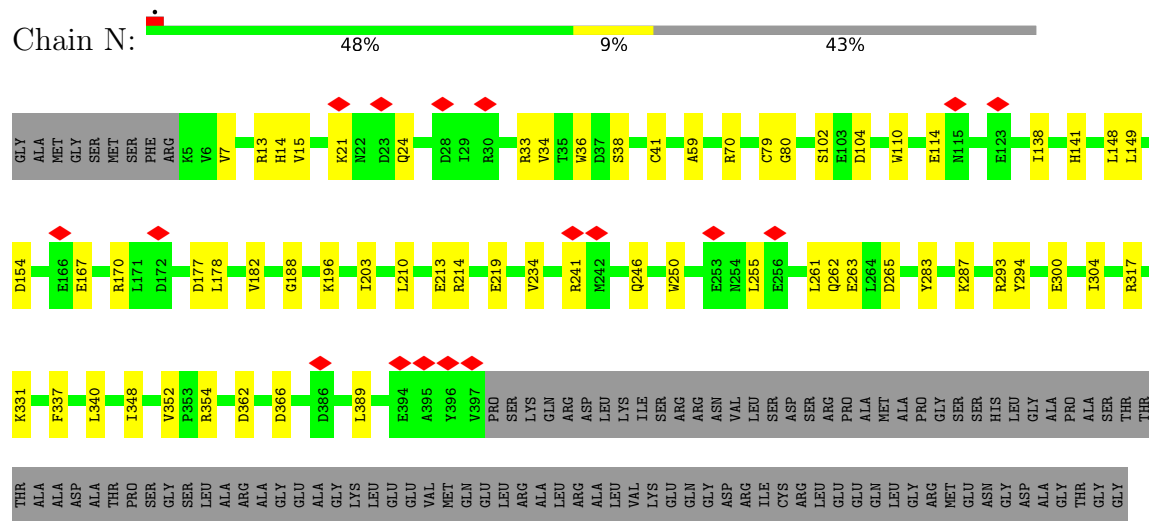
- Molecule 3: Coronin-1B,Methylated-DNA--protein-cysteine methyltransferase



- Molecule 3: Coronin-1B,Methylated-DNA--protein-cysteine methyltransferase



- Molecule 3: Coronin-1B,Methylated-DNA--protein-cysteine methyltransferase



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

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	40453	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION; Patch CTF	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	65.8	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2700	Depositor
Magnification	105000	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.187	Depositor
Minimum map value	-0.105	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.006	Depositor
Recommended contour level	0.0329	Depositor
Map size (Å)	408.0, 408.0, 408.0	wwPDB
Map dimensions	600, 600, 600	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.68, 0.68, 0.68	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, HIC, 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	0.10	0/2854	0.28	0/3864
1	B	0.11	0/2909	0.26	0/3937
1	C	0.11	0/2854	0.28	1/3864 (0.0%)
1	D	0.11	0/2909	0.26	0/3937
1	E	0.11	0/2854	0.27	0/3864
1	F	0.10	0/2909	0.25	0/3937
1	G	0.11	0/2854	0.28	0/3864
2	H	0.10	0/1307	0.31	0/1752
2	I	0.10	0/1307	0.30	0/1752
2	J	0.10	0/1307	0.27	0/1752
2	K	0.11	0/1307	0.32	0/1752
3	L	0.11	0/3167	0.28	0/4308
3	M	0.12	0/3167	0.28	0/4308
3	N	0.11	0/3167	0.29	0/4308
All	All	0.11	0/34872	0.28	1/47199 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	62	ARG	CB-CA-C	-5.31	110.01	117.23

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	2806	0	2775	43	0
1	B	2860	0	2833	24	0
1	C	2806	0	2775	31	0
1	D	2860	0	2833	33	0
1	E	2806	0	2775	34	0
1	F	2860	0	2833	32	0
1	G	2806	0	2775	49	0
2	H	1288	0	1333	18	0
2	I	1288	0	1333	23	0
2	J	1288	0	1333	17	0
2	K	1288	0	1333	19	0
3	L	3090	0	3032	41	0
3	M	3090	0	3032	37	0
3	N	3090	0	3032	41	0
4	A	27	0	12	3	0
4	B	27	0	12	2	0
4	C	27	0	12	1	0
4	D	27	0	12	2	0
4	E	27	0	12	3	0
4	F	27	0	12	3	0
4	G	27	0	12	2	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
5	C	1	0	0	0	0
5	D	1	0	0	0	0
5	E	1	0	0	0	0
5	F	1	0	0	0	0
5	G	1	0	0	0	0
All	All	34422	0	34111	410	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 6.

The worst 5 of 410 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)
3:N:214:ARG:HB2	3:N:255:LEU:HD23	1.65	0.77
1:G:120:THR:HA	1:G:132:MET:HE1	1.67	0.75
1:D:120:THR:HG23	1:D:132:MET:HE1	1.69	0.74

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:53:TYR:HB3	1:A:57:GLU:HG3	1.72	0.72
1:A:299:LEU:HB3	1:A:304:THR:HG21	1.72	0.70

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	354/374 (95%)	349 (99%)	5 (1%)	0	100	100
1	B	361/374 (96%)	357 (99%)	4 (1%)	0	100	100
1	C	354/374 (95%)	347 (98%)	7 (2%)	0	100	100
1	D	361/374 (96%)	356 (99%)	5 (1%)	0	100	100
1	E	354/374 (95%)	349 (99%)	5 (1%)	0	100	100
1	F	361/374 (96%)	356 (99%)	5 (1%)	0	100	100
1	G	354/374 (95%)	350 (99%)	3 (1%)	1 (0%)	37	67
2	H	163/166 (98%)	160 (98%)	3 (2%)	0	100	100
2	I	163/166 (98%)	160 (98%)	3 (2%)	0	100	100
2	J	163/166 (98%)	163 (100%)	0	0	100	100
2	K	163/166 (98%)	161 (99%)	2 (1%)	0	100	100
3	L	391/688 (57%)	383 (98%)	8 (2%)	0	100	100
3	M	391/688 (57%)	386 (99%)	5 (1%)	0	100	100
3	N	391/688 (57%)	384 (98%)	7 (2%)	0	100	100
All	All	4324/5346 (81%)	4261 (98%)	62 (1%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	G	72	GLU

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	303/315 (96%)	302 (100%)	1 (0%)	91	95
1	B	309/315 (98%)	309 (100%)	0	100	100
1	C	303/315 (96%)	302 (100%)	1 (0%)	91	95
1	D	309/315 (98%)	309 (100%)	0	100	100
1	E	303/315 (96%)	302 (100%)	1 (0%)	91	95
1	F	309/315 (98%)	309 (100%)	0	100	100
1	G	303/315 (96%)	303 (100%)	0	100	100
2	H	143/144 (99%)	143 (100%)	0	100	100
2	I	143/144 (99%)	143 (100%)	0	100	100
2	J	143/144 (99%)	142 (99%)	1 (1%)	81	90
2	K	143/144 (99%)	143 (100%)	0	100	100
3	L	341/562 (61%)	341 (100%)	0	100	100
3	M	341/562 (61%)	341 (100%)	0	100	100
3	N	341/562 (61%)	341 (100%)	0	100	100
All	All	3734/4467 (84%)	3730 (100%)	4 (0%)	92	97

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	128	ASN
1	C	65	LEU
1	E	303	THR
2	J	138	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 16 such sidechains are listed below:

Mol	Chain	Res	Type
3	M	18	GLN
3	M	14	HIS
1	F	78	ASN
3	L	218	HIS
1	E	128	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

7 non-standard protein/DNA/RNA residues are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
1	HIC	F	73	1	8,11,12	1.05	1 (12%)	6,14,16	0.79	0
1	HIC	D	73	1	8,11,12	1.04	1 (12%)	6,14,16	0.76	0
1	HIC	G	73	1	8,11,12	1.05	1 (12%)	6,14,16	0.80	0
1	HIC	C	73	1	8,11,12	1.06	1 (12%)	6,14,16	0.80	0
1	HIC	E	73	1	8,11,12	1.06	1 (12%)	6,14,16	0.79	0
1	HIC	B	73	1	8,11,12	1.04	1 (12%)	6,14,16	0.79	0
1	HIC	A	73	1	8,11,12	1.06	1 (12%)	6,14,16	0.80	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	HIC	F	73	1	-	0/5/6/8	0/1/1/1
1	HIC	D	73	1	-	0/5/6/8	0/1/1/1
1	HIC	G	73	1	-	1/5/6/8	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	HIC	C	73	1	-	0/5/6/8	0/1/1/1
1	HIC	E	73	1	-	0/5/6/8	0/1/1/1
1	HIC	B	73	1	-	0/5/6/8	0/1/1/1
1	HIC	A	73	1	-	0/5/6/8	0/1/1/1

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	73	HIC	CE1-ND1	-2.21	1.31	1.35
1	A	73	HIC	CE1-ND1	-2.20	1.31	1.35
1	E	73	HIC	CE1-ND1	-2.19	1.31	1.35
1	F	73	HIC	CE1-ND1	-2.18	1.31	1.35
1	B	73	HIC	CE1-ND1	-2.18	1.31	1.35

There are no bond angle outliers.

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	G	73	HIC	CA-CB-CG-ND1

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 14 ligands modelled in this entry, 7 are monoatomic - leaving 7 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
4	ADP	G	401	5	24,29,29	0.93	1 (4%)	29,45,45	1.44	4 (13%)
4	ADP	D	401	5	24,29,29	0.93	1 (4%)	29,45,45	1.37	4 (13%)
4	ADP	F	401	5	24,29,29	0.94	1 (4%)	29,45,45	1.37	4 (13%)
4	ADP	C	401	5	24,29,29	0.93	1 (4%)	29,45,45	1.41	4 (13%)
4	ADP	B	401	5	24,29,29	0.93	1 (4%)	29,45,45	1.37	4 (13%)
4	ADP	E	401	5	24,29,29	0.93	1 (4%)	29,45,45	1.44	4 (13%)
4	ADP	A	401	5	24,29,29	0.94	1 (4%)	29,45,45	1.44	4 (13%)

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
4	ADP	G	401	5	-	5/12/32/32	0/3/3/3
4	ADP	D	401	5	-	5/12/32/32	0/3/3/3
4	ADP	F	401	5	-	5/12/32/32	0/3/3/3
4	ADP	C	401	5	-	5/12/32/32	0/3/3/3
4	ADP	B	401	5	-	5/12/32/32	0/3/3/3
4	ADP	E	401	5	-	5/12/32/32	0/3/3/3
4	ADP	A	401	5	-	5/12/32/32	0/3/3/3

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	401	ADP	C5-C4	2.42	1.47	1.40
4	F	401	ADP	C5-C4	2.40	1.47	1.40
4	G	401	ADP	C5-C4	2.40	1.47	1.40
4	E	401	ADP	C5-C4	2.40	1.47	1.40
4	C	401	ADP	C5-C4	2.39	1.47	1.40

The worst 5 of 28 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	401	ADP	PA-O3A-PB	-3.46	120.96	132.83
4	G	401	ADP	PA-O3A-PB	-3.41	121.13	132.83
4	E	401	ADP	PA-O3A-PB	-3.37	121.25	132.83
4	C	401	ADP	PA-O3A-PB	-3.29	121.53	132.83
4	B	401	ADP	N3-C2-N1	-3.23	123.63	128.68

There are no chirality outliers.

5 of 35 torsion outliers are listed below:

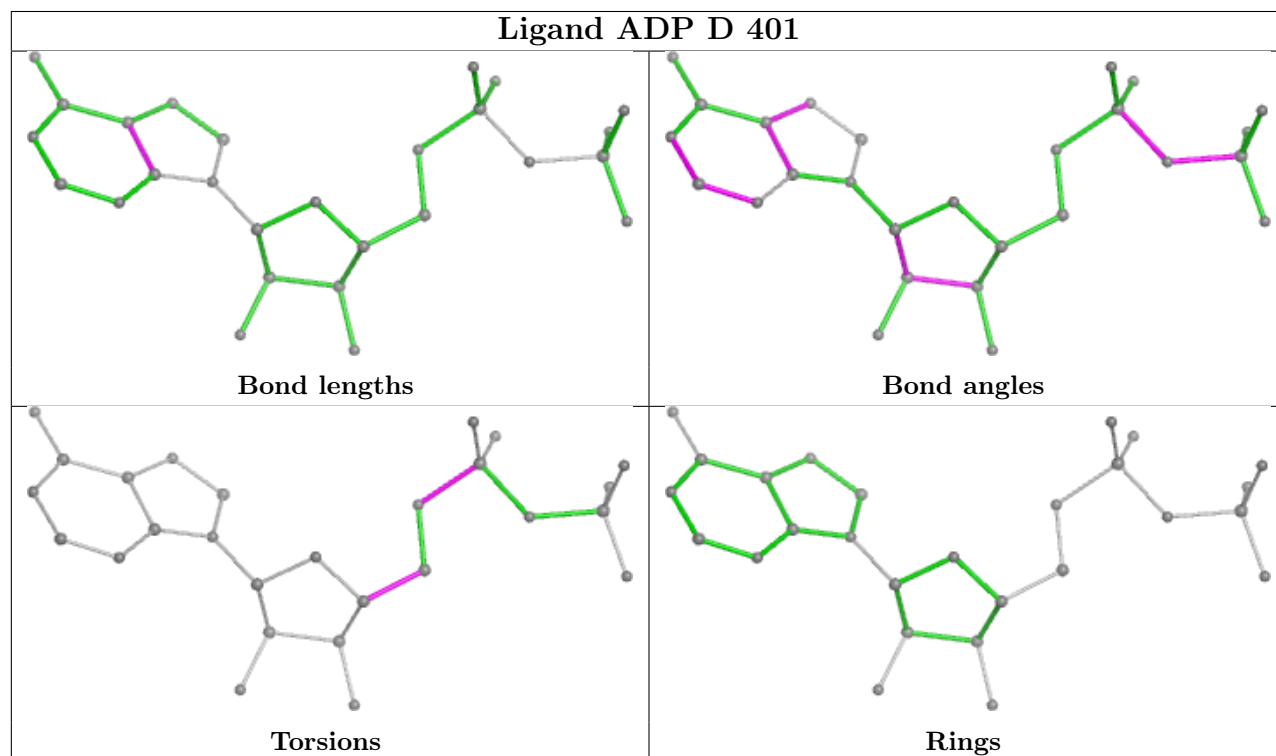
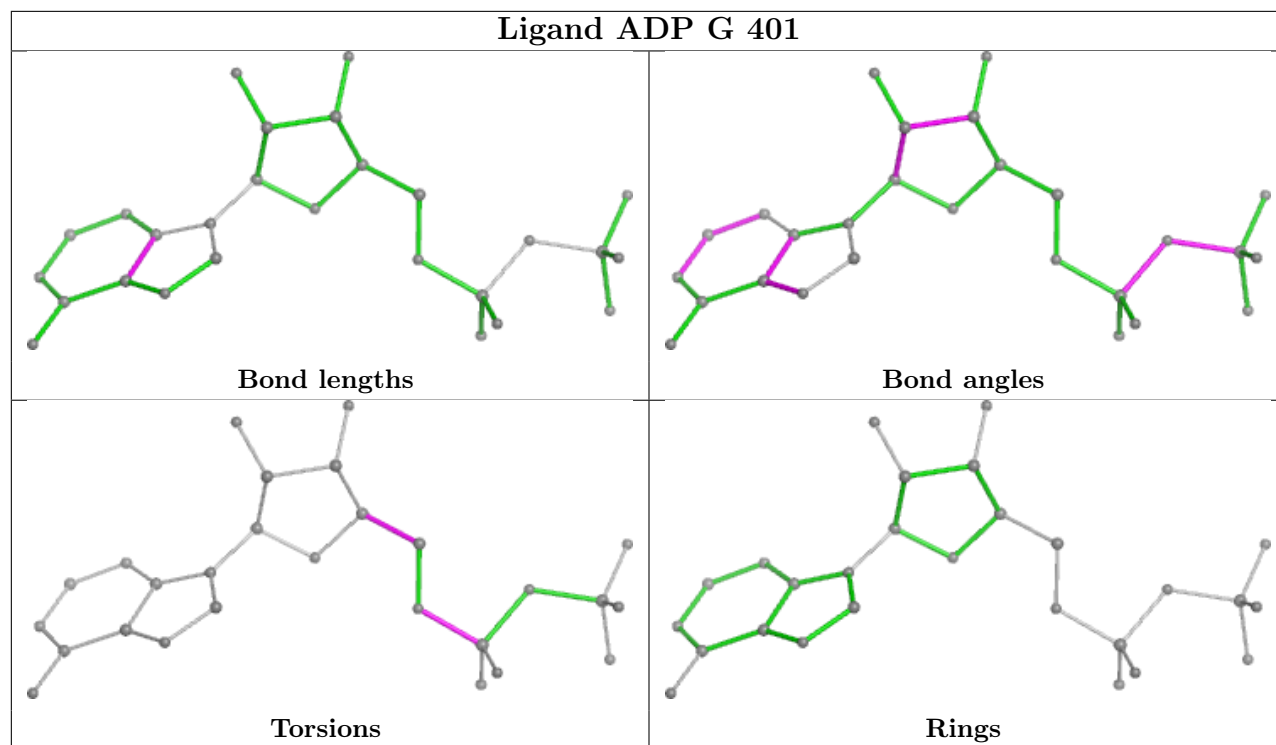
Mol	Chain	Res	Type	Atoms
4	A	401	ADP	C5'-O5'-PA-O3A
4	A	401	ADP	O4'-C4'-C5'-O5'
4	A	401	ADP	C3'-C4'-C5'-O5'
4	B	401	ADP	C5'-O5'-PA-O1A
4	B	401	ADP	C5'-O5'-PA-O2A

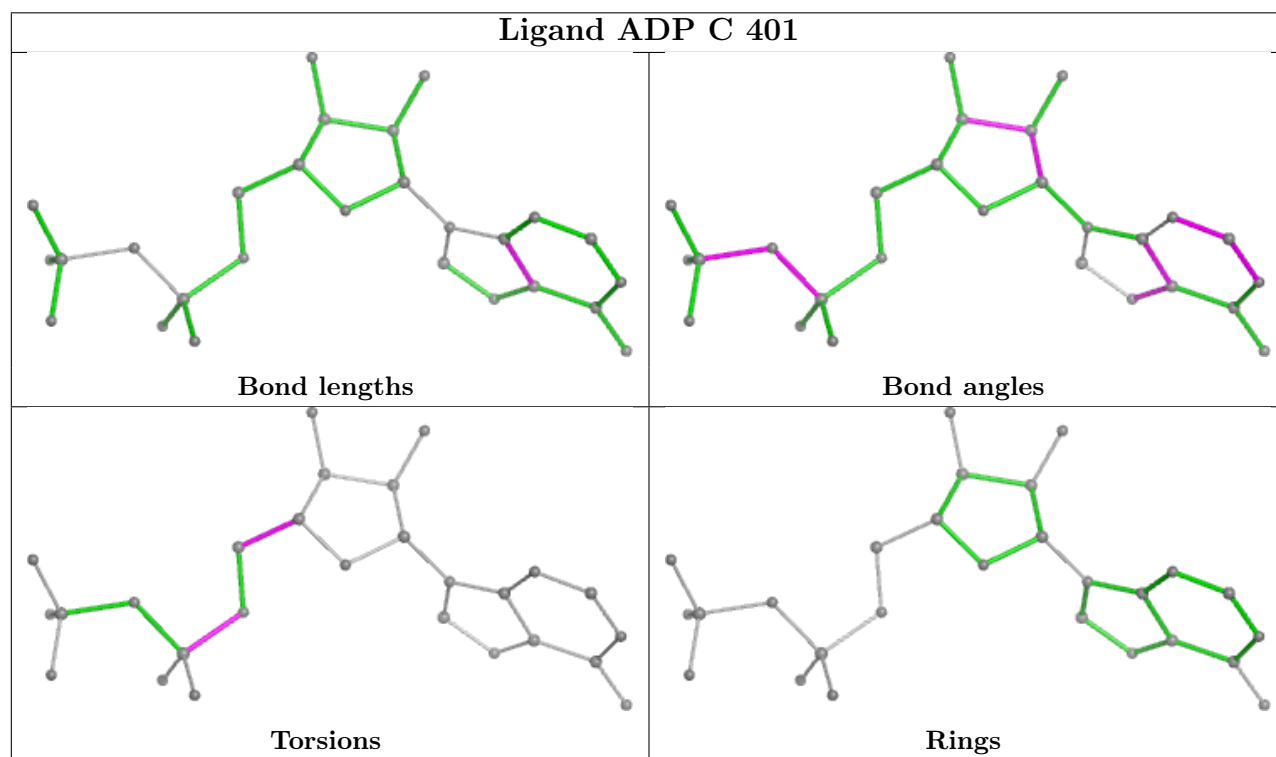
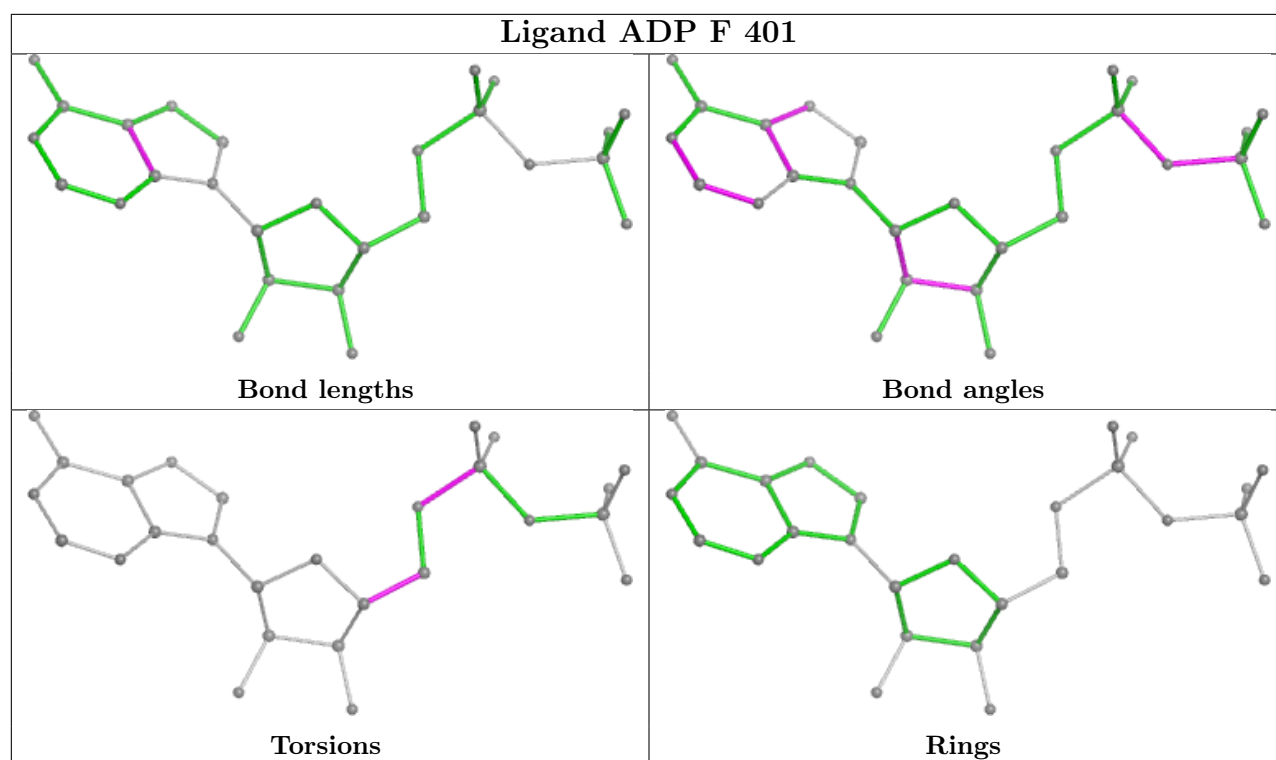
There are no ring outliers.

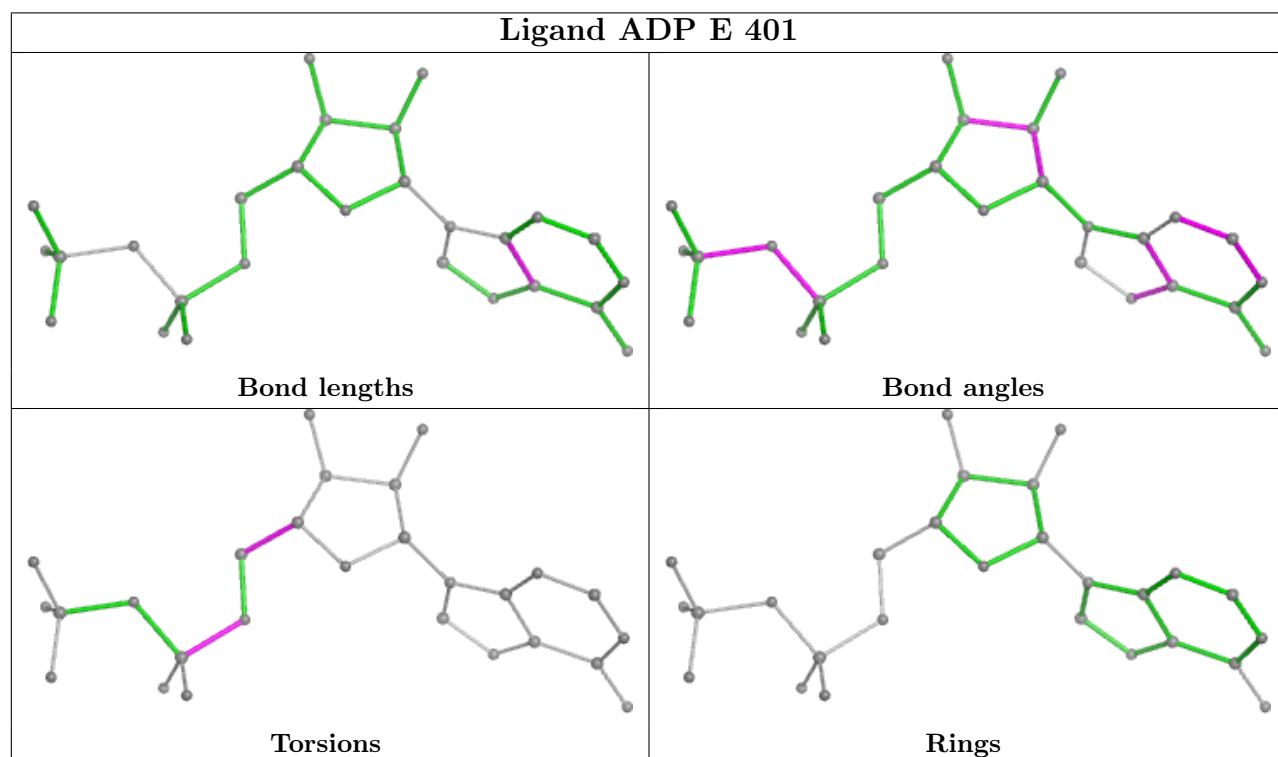
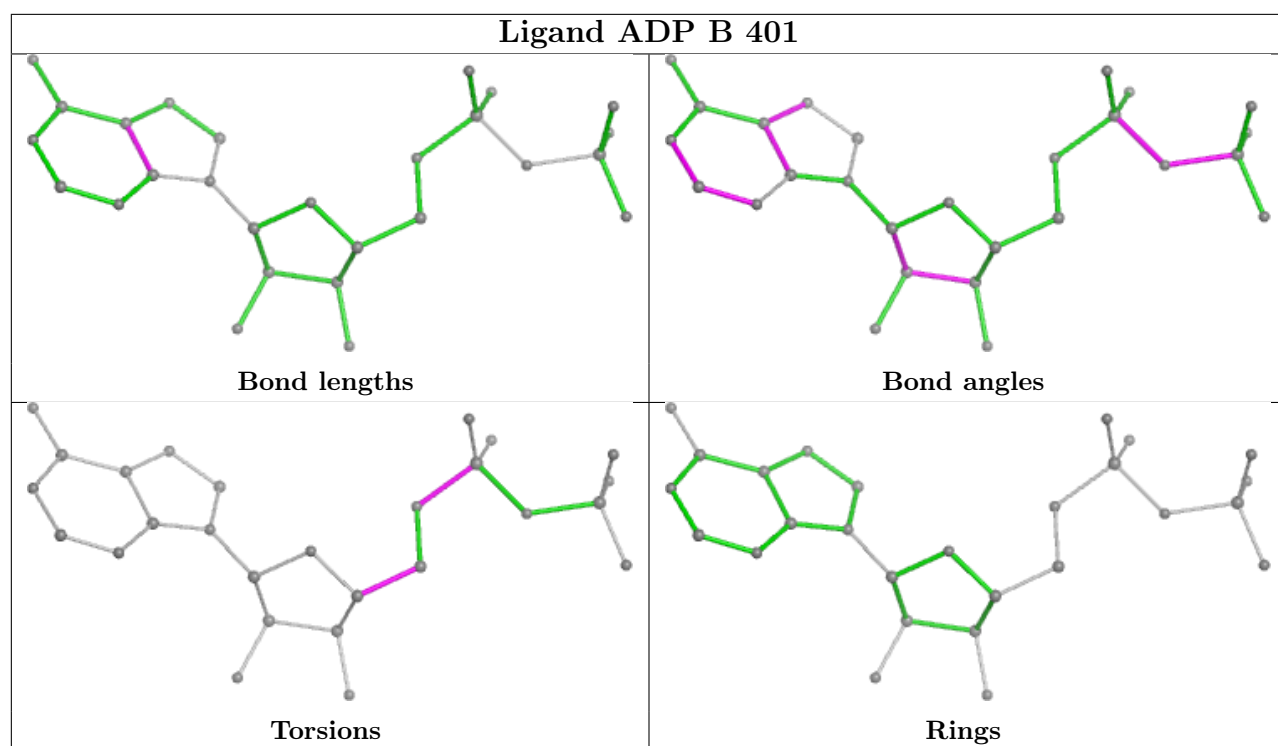
7 monomers are involved in 16 short contacts:

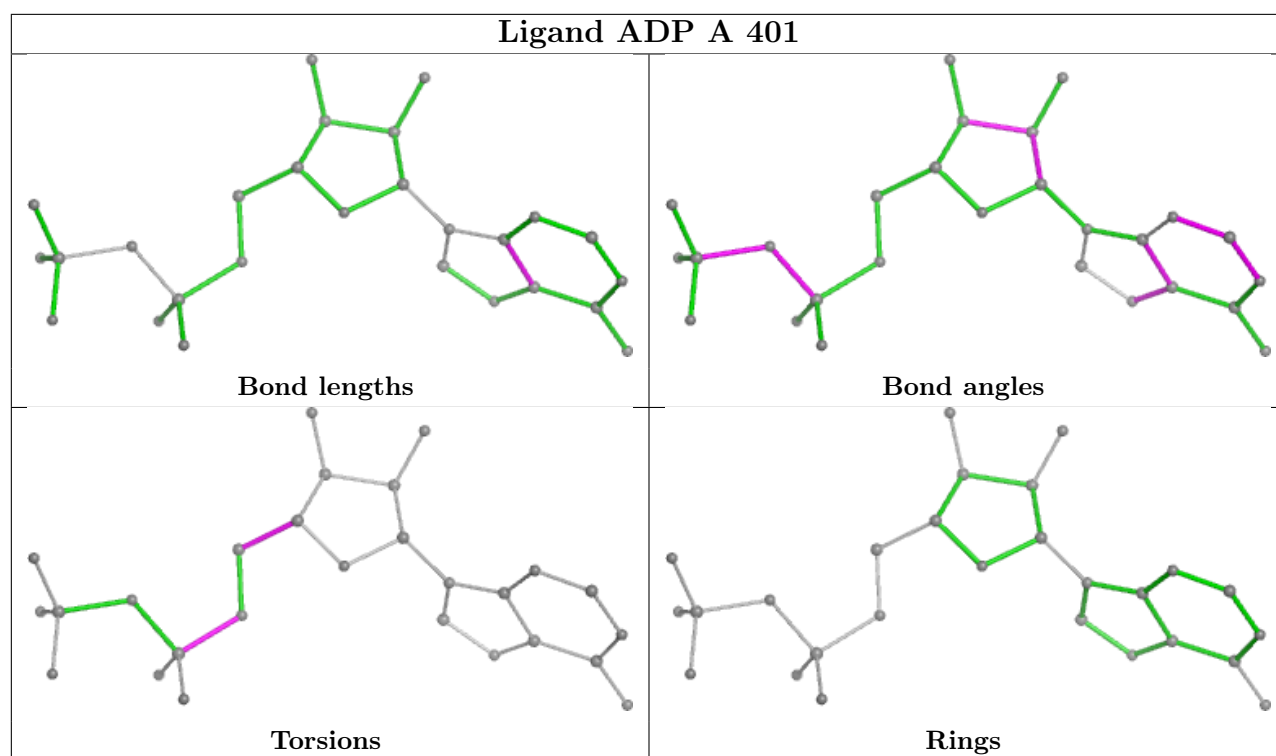
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	G	401	ADP	2	0
4	D	401	ADP	2	0
4	F	401	ADP	3	0
4	C	401	ADP	1	0
4	B	401	ADP	2	0
4	E	401	ADP	3	0
4	A	401	ADP	3	0

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.

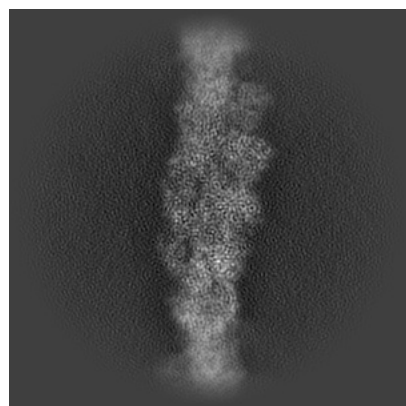
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-53107. These allow visual inspection of the internal detail of the map and identification of artifacts.

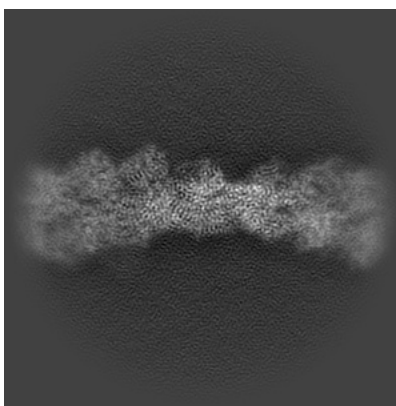
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

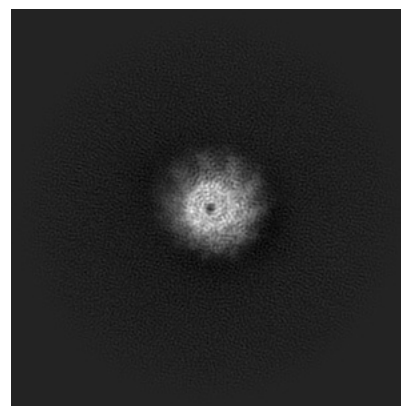
6.1.1 Primary map



X

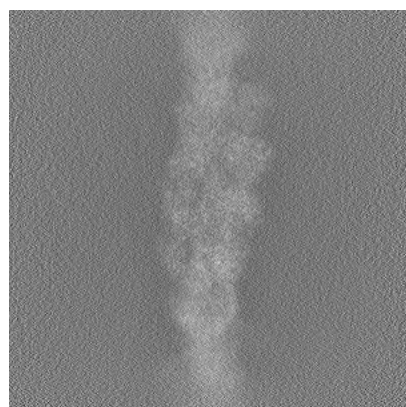


Y

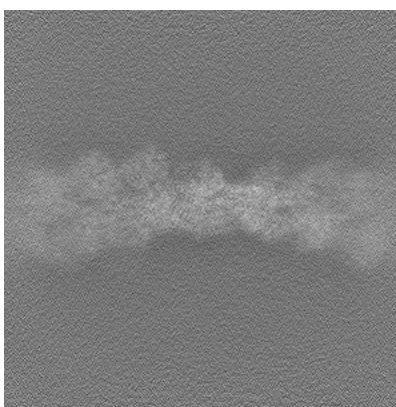


Z

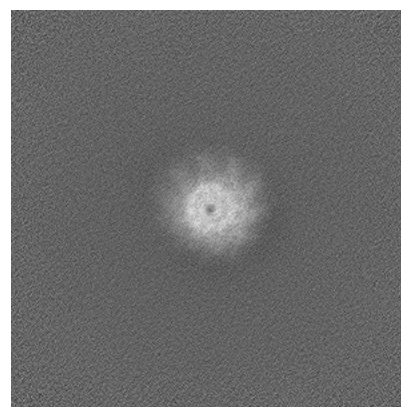
6.1.2 Raw map



X



Y

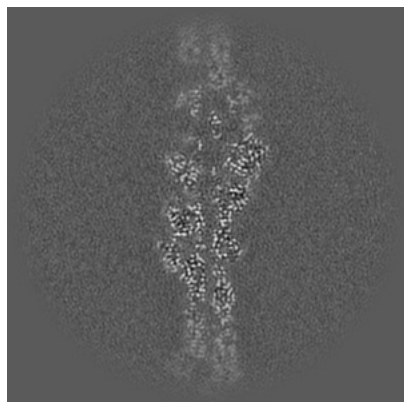


Z

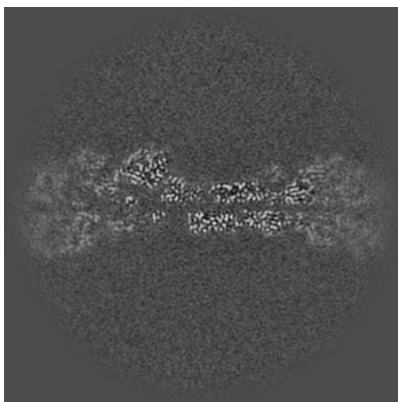
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

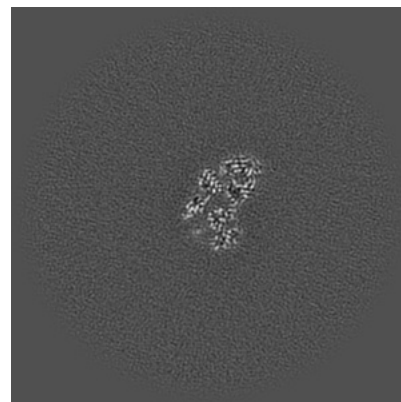
6.2.1 Primary map



X Index: 300

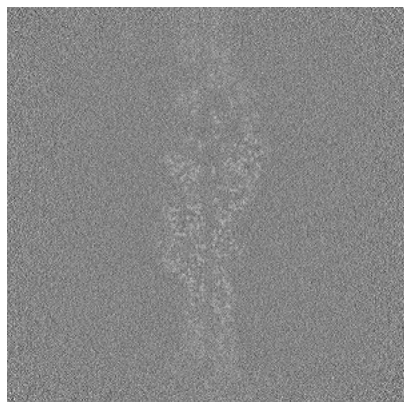


Y Index: 300

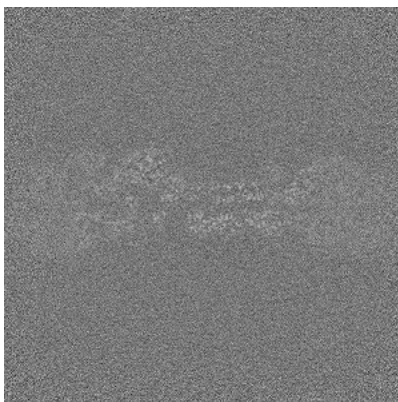


Z Index: 300

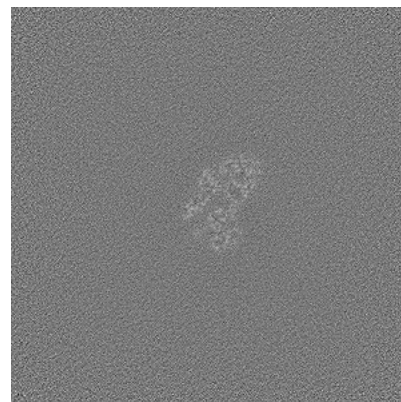
6.2.2 Raw map



X Index: 300



Y Index: 300

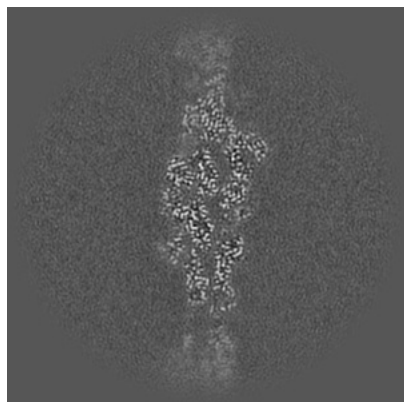


Z Index: 300

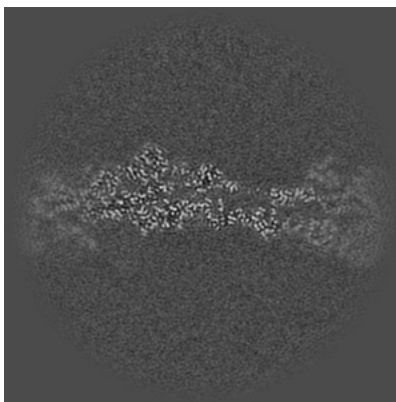
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

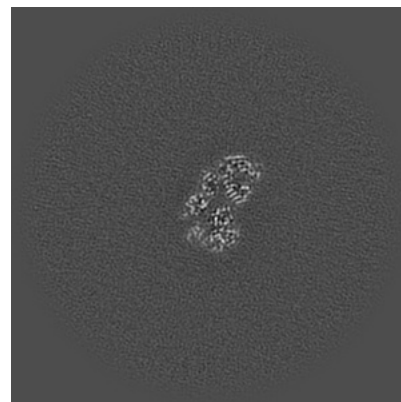
6.3.1 Primary map



X Index: 312

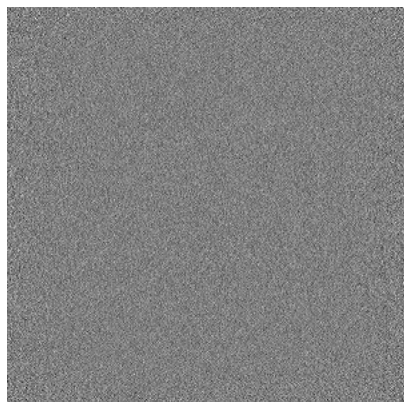


Y Index: 321

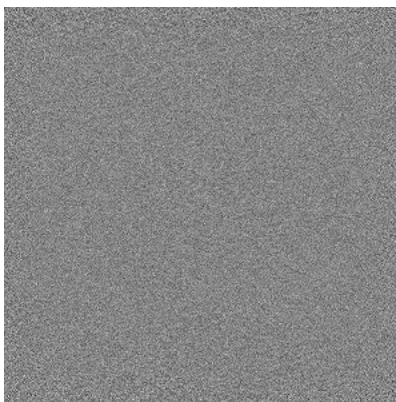


Z Index: 295

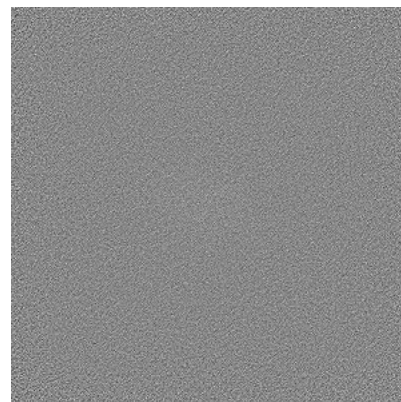
6.3.2 Raw map



X Index: 0



Y Index: 0

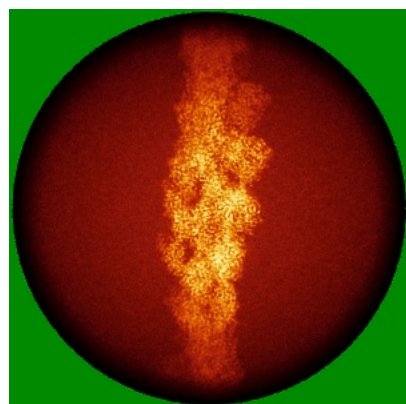


Z Index: 0

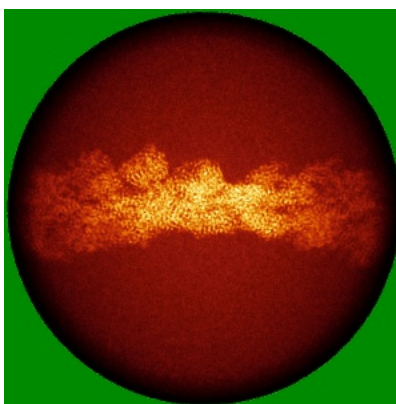
The images above show the largest variance slices of the map in three orthogonal directions.

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

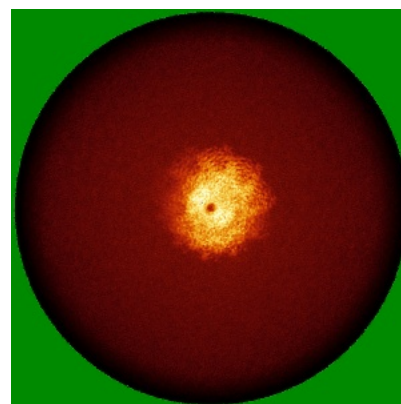
6.4.1 Primary map



X

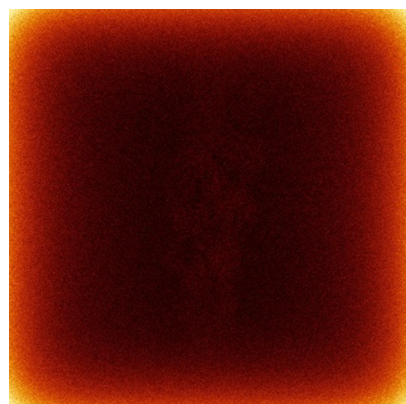


Y

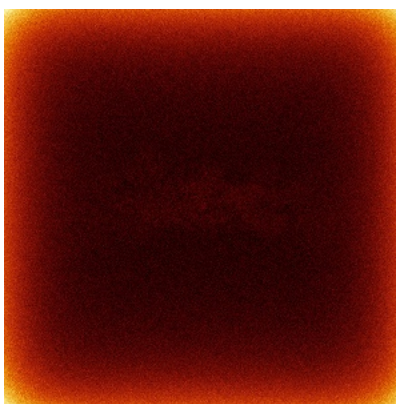


Z

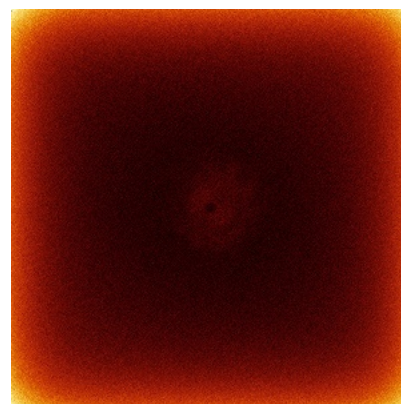
6.4.2 Raw map



X



Y

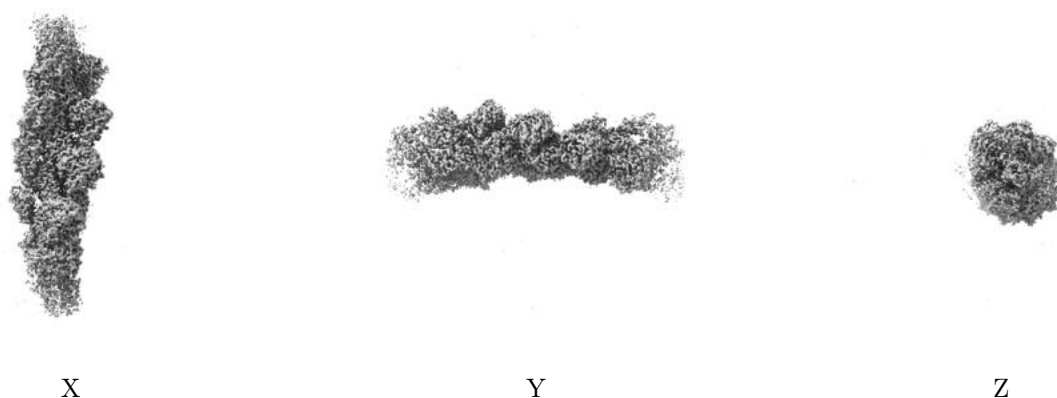


Z

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.

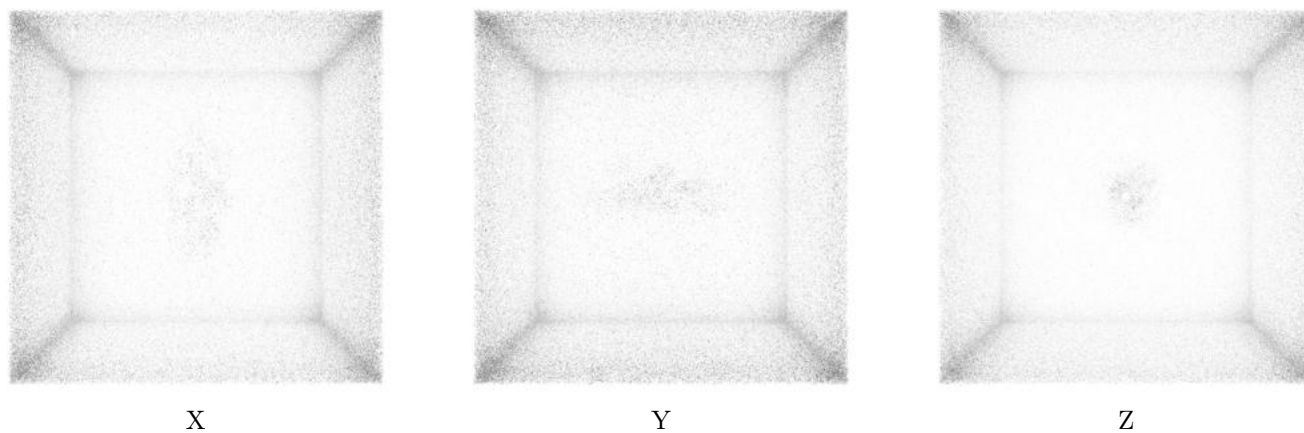
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.0329. 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.

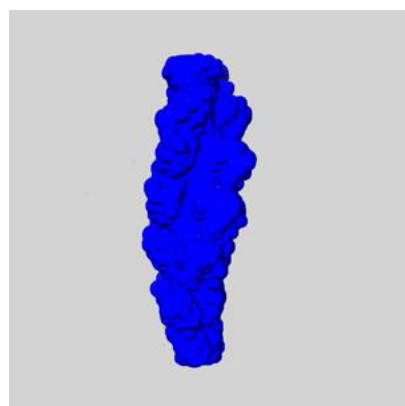
6.6 Mask visualisation [i](#)

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

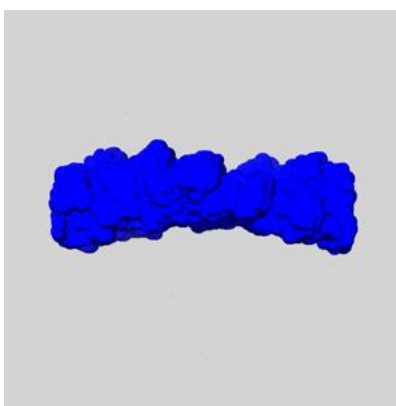
A mask typically either:

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

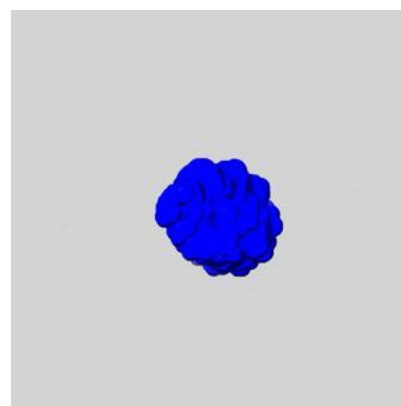
6.6.1 emd_53107_msk_1.map [i](#)



X



Y

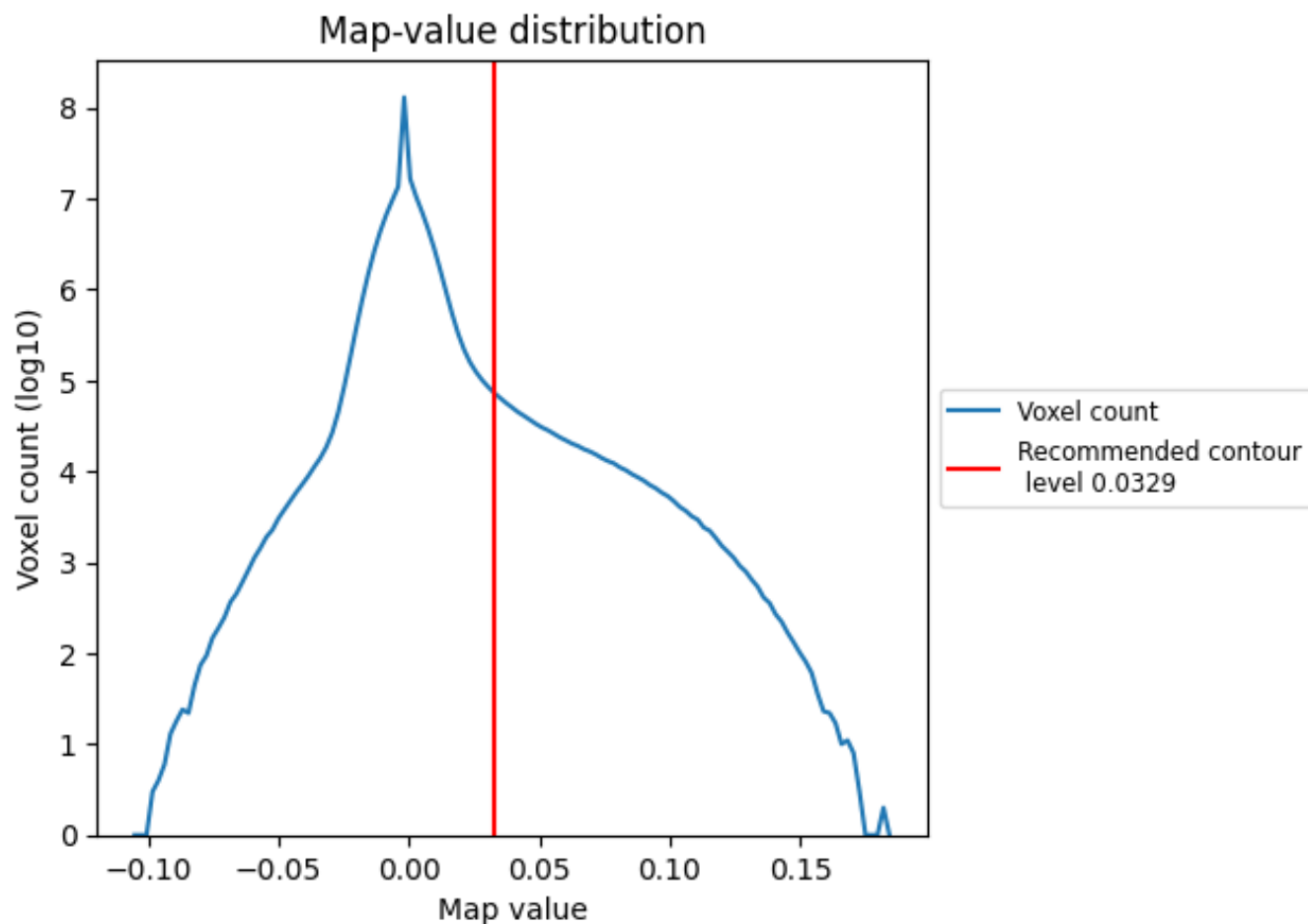


Z

7 Map analysis [i](#)

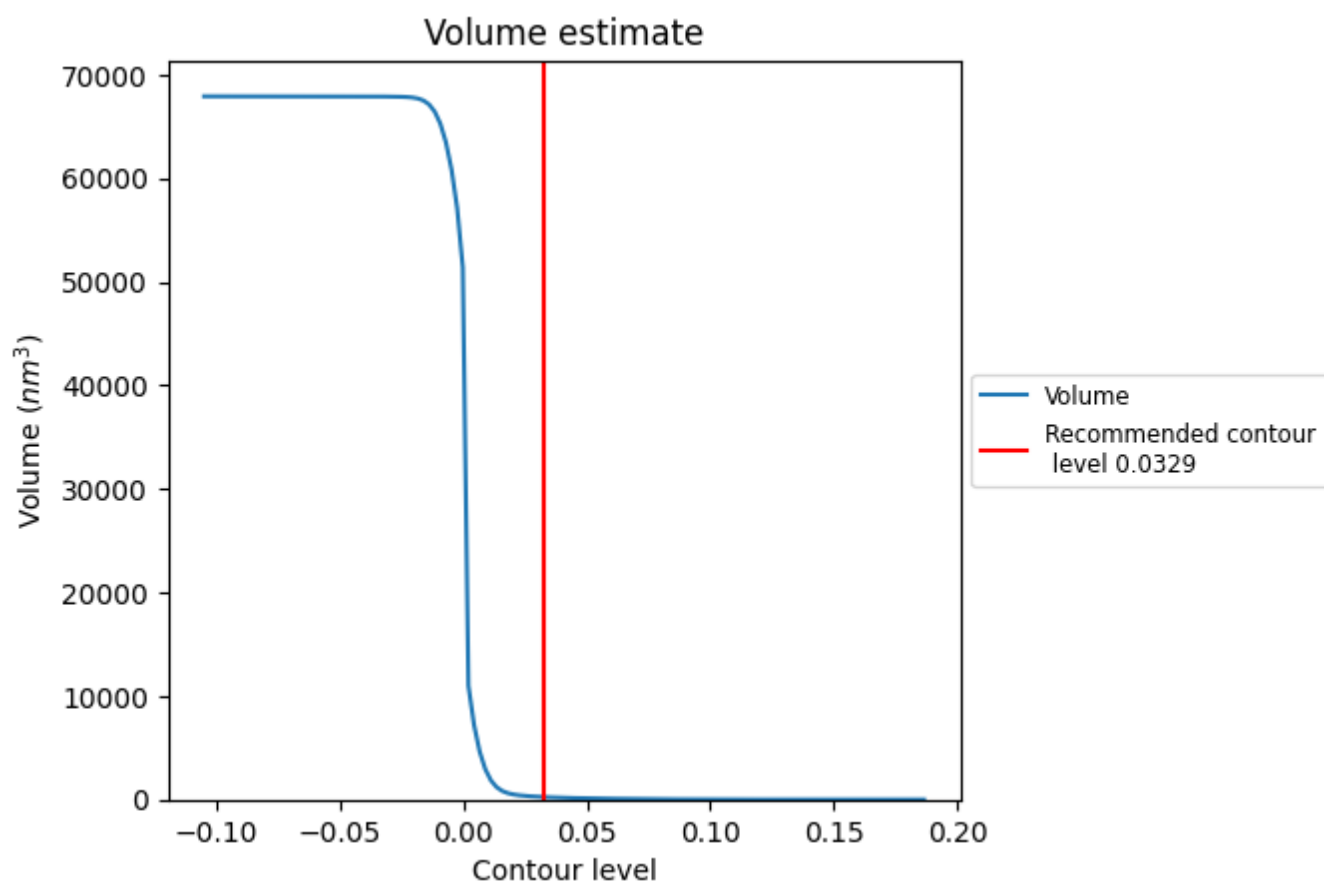
This section contains the results of statistical analysis of the map.

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.

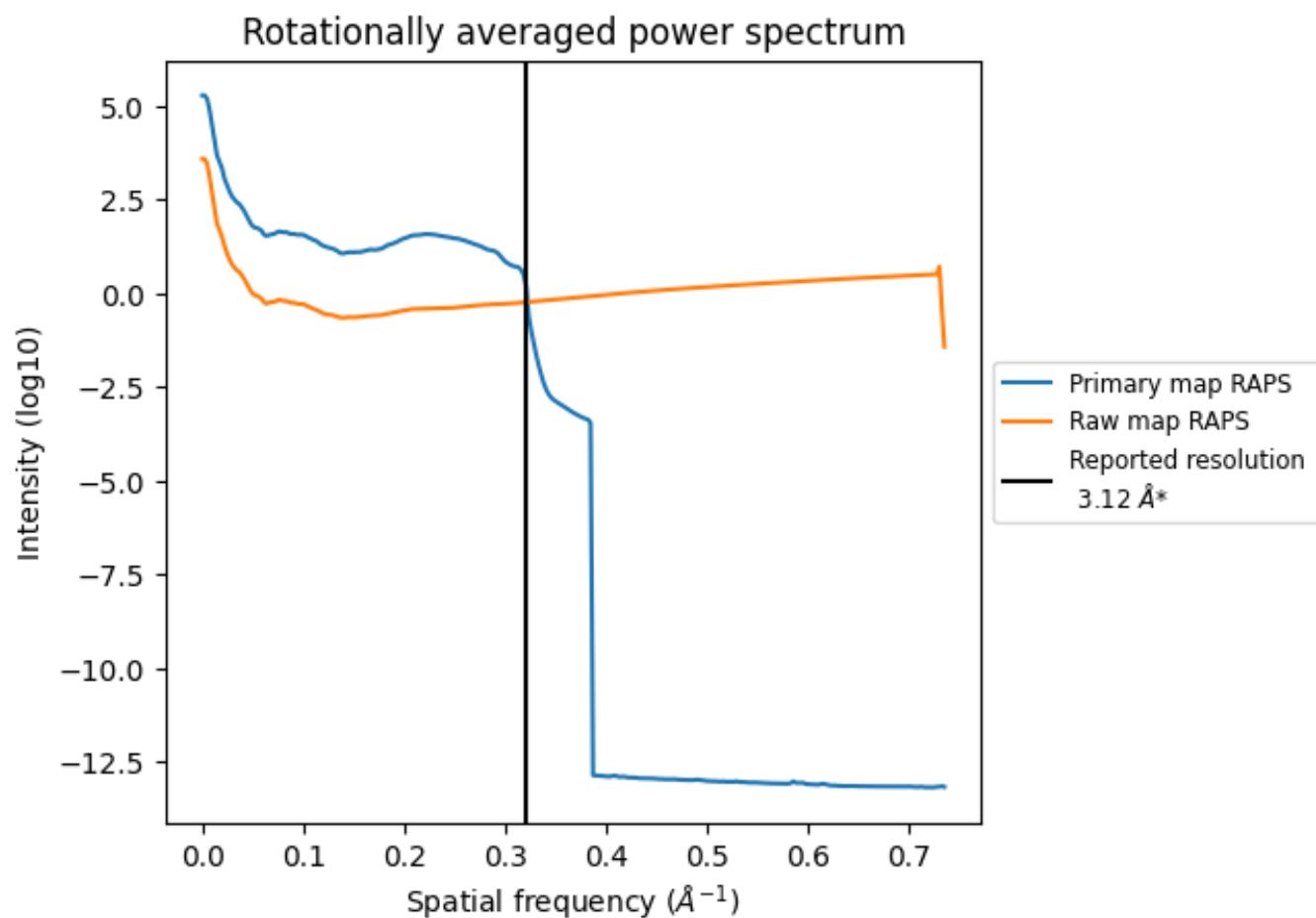
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 239 nm³; this corresponds to an approximate mass of 215 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 ⓘ

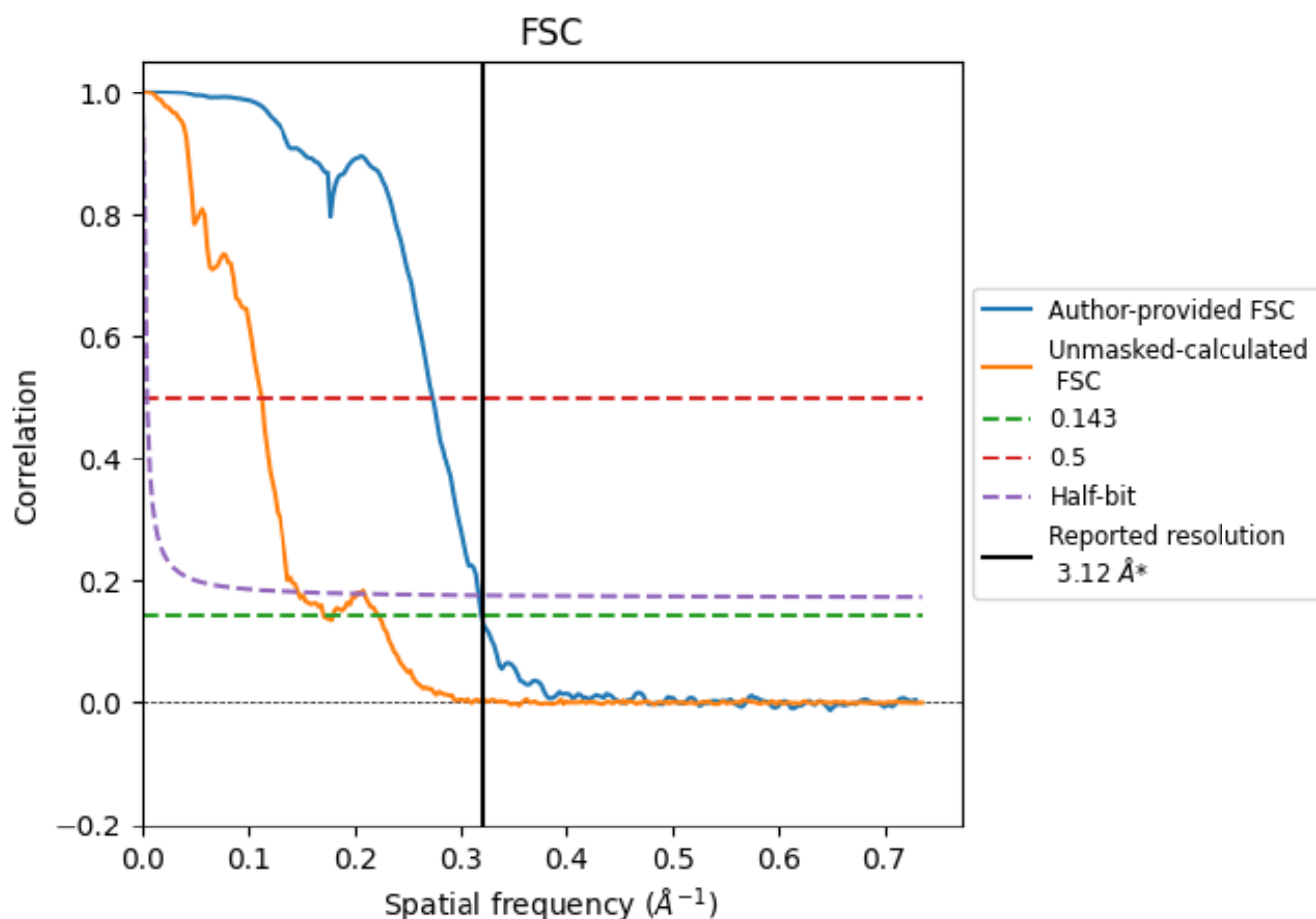


*Reported resolution corresponds to spatial frequency of 0.321 Å⁻¹

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 0.321 Å⁻¹

8.2 Resolution estimates [i](#)

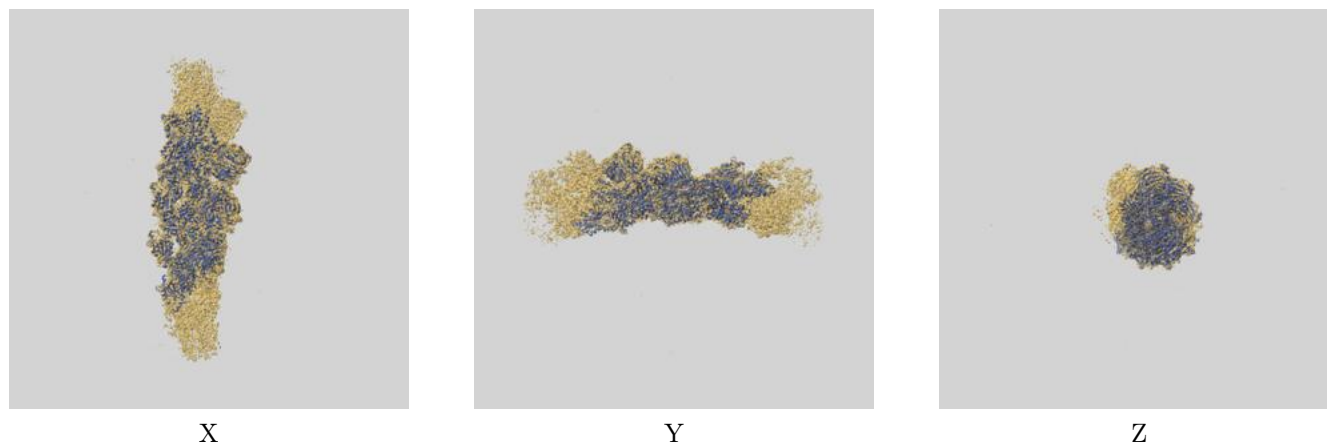
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.12	-	-
Author-provided FSC curve	3.12	3.66	3.15
Unmasked-calculated*	5.84	8.90	6.80

*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 5.84 differs from the reported value 3.12 by more than 10 %

9 Map-model fit [i](#)

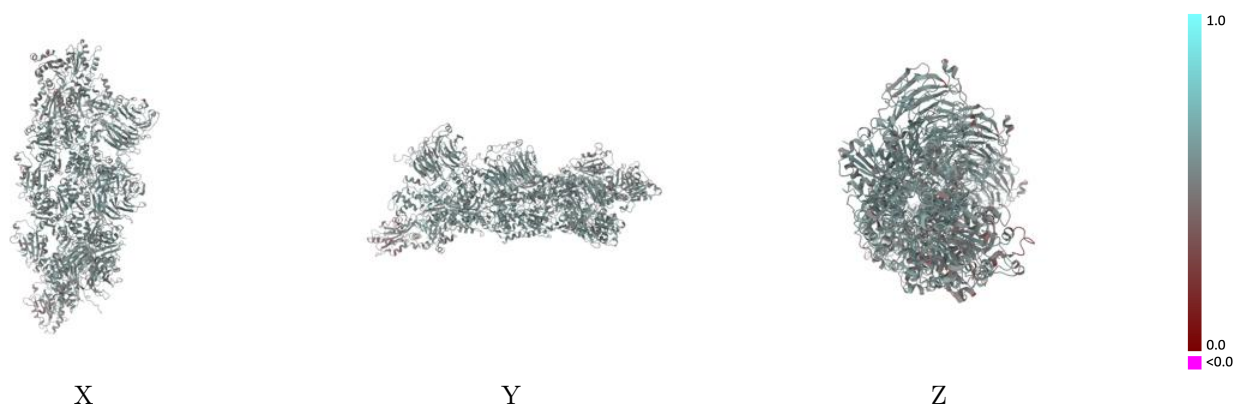
This section contains information regarding the fit between EMDB map EMD-53107 and PDB model 9QFE. Per-residue inclusion information can be found in section [3](#) on page [9](#).

9.1 Map-model overlay [i](#)



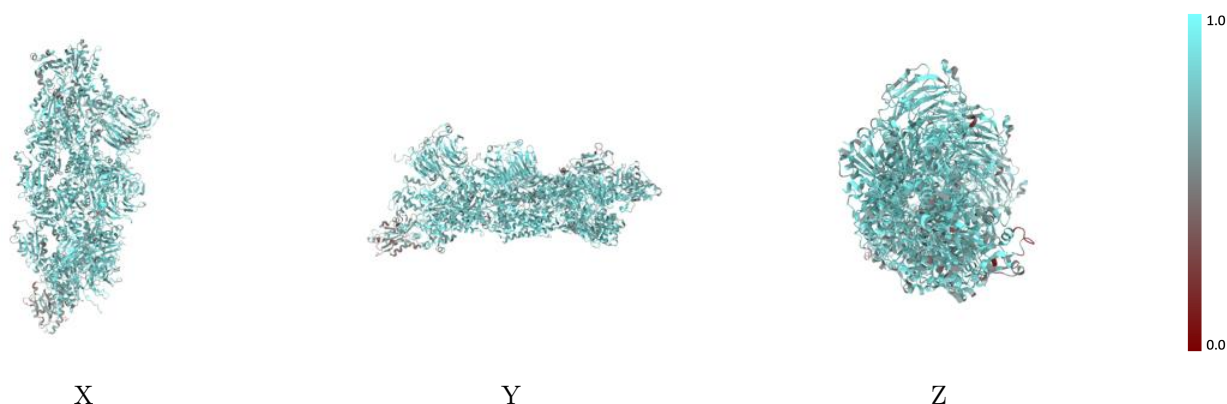
The images above show the 3D surface view of the map at the recommended contour level 0.0329 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



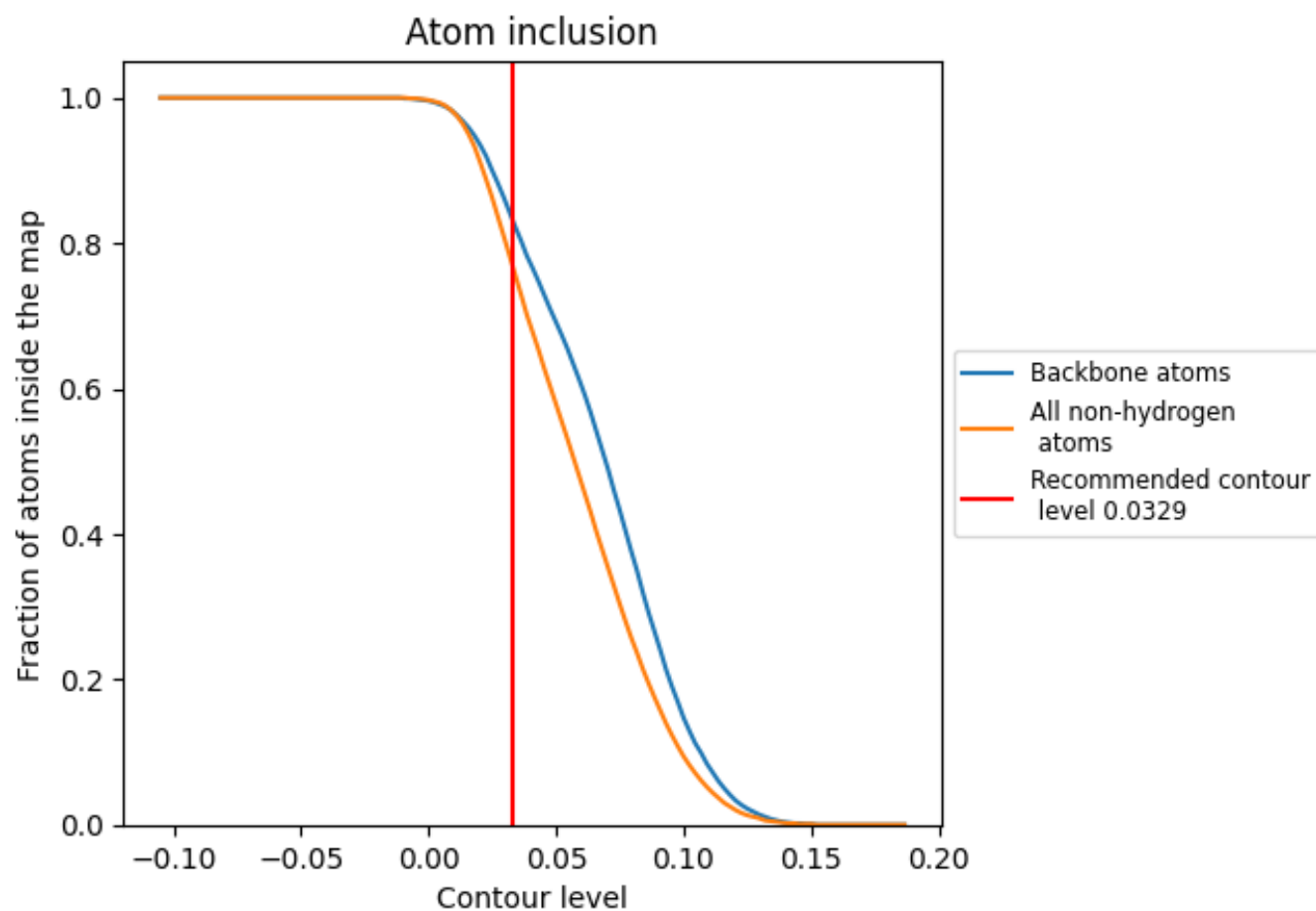
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.0329).

9.4 Atom inclusion [i](#)



At the recommended contour level, 83% of all backbone atoms, 77% 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 (0.0329) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div></div> 0.7690	<div></div> 0.5310
A	<div></div> 0.7690	<div></div> 0.5290
B	<div></div> 0.8140	<div></div> 0.5540
C	<div></div> 0.8200	<div></div> 0.5450
D	<div></div> 0.8280	<div></div> 0.5610
E	<div></div> 0.8070	<div></div> 0.5450
F	<div></div> 0.7920	<div></div> 0.5460
G	<div></div> 0.7310	<div></div> 0.5090
H	<div></div> 0.4970	<div></div> 0.4400
I	<div></div> 0.7350	<div></div> 0.5180
J	<div></div> 0.7380	<div></div> 0.5200
K	<div></div> 0.6840	<div></div> 0.4950
L	<div></div> 0.7520	<div></div> 0.5210
M	<div></div> 0.7960	<div></div> 0.5390
N	<div></div> 0.7680	<div></div> 0.5330

