Full wwPDB EM Validation Report ⓘ

Nov 12, 2026 – 03:46 pm GMT

PDB ID	:	9IG0 / pdb_00009ig0
EMDB ID	:	EMD-52848
Title	:	Low resolution structure of RAD51-G4 complex
Authors	:	Pospisilova, M.; Kubicek, K.; Prokop, Z.; Sommerova, L.; Nikulenkov, F.; Spirek, M.; Skehel, M.; Chapman, R.; Krejci, L.
Deposited on	:	2025-02-18
Resolution	:	6.12 Å(reported)

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

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/EMValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

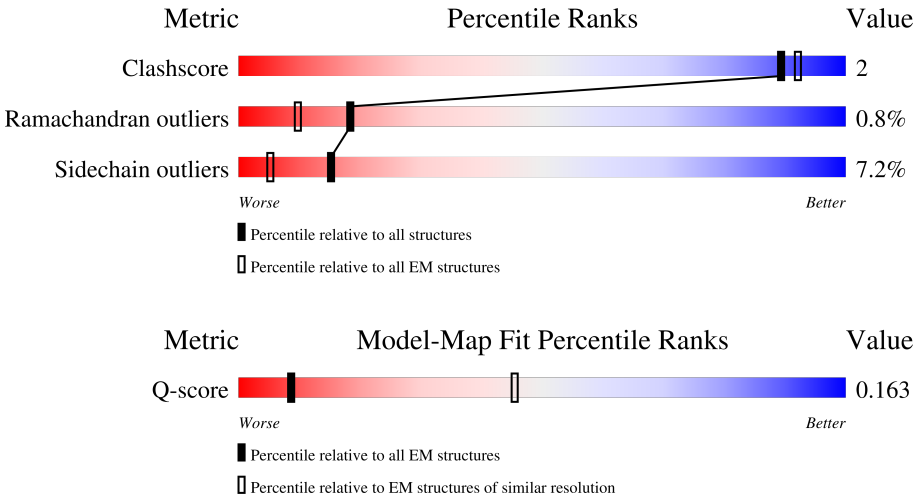
EMDB validation analysis	:	0.0.1.dev133
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.2
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.51

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 6.12 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.



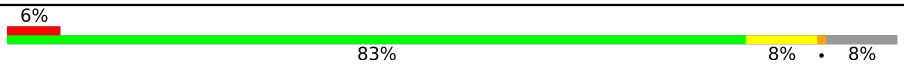
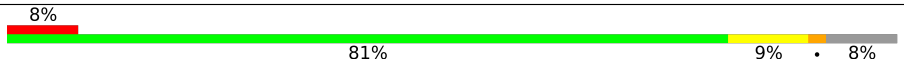
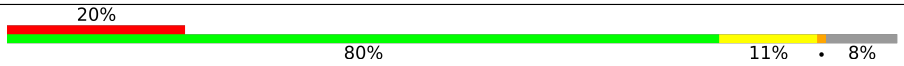
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	501 (5.62 - 6.62)

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 <=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	B	339	5% 76% 14% • 8%
1	C	339	• 80% 10% • 8%
1	D	339	9% 85% 7% 8%
1	E	339	• 77% 12% • 8%

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Mol	Chain	Length	Quality of chain
1	F	339	
1	G	339	
1	H	339	

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 33854 atoms, of which 16934 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.

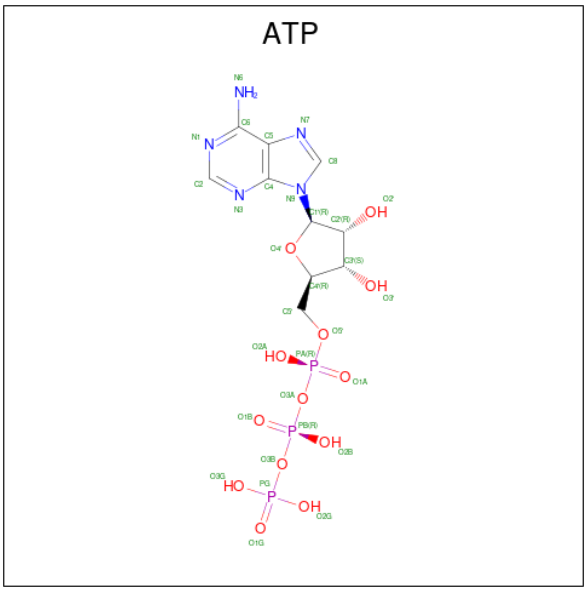
- Molecule 1 is a protein called DNA repair protein RAD51 homolog 1.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	B	311	Total 4791	C 1493	H 2407	N 421	O 457	S 13	0	0
1	C	311	Total 4792	C 1493	H 2408	N 421	O 457	S 13	0	0
1	D	311	Total 4791	C 1493	H 2407	N 421	O 457	S 13	0	0
1	E	311	Total 4791	C 1493	H 2407	N 421	O 457	S 13	0	0
1	F	311	Total 4791	C 1493	H 2407	N 421	O 457	S 13	0	0
1	G	311	Total 4791	C 1493	H 2407	N 421	O 457	S 13	0	0
1	H	311	Total 4791	C 1493	H 2407	N 421	O 457	S 13	0	0

- Molecule 2 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		AltConf
2	B	3	Total 3	Ca 3	0
2	C	2	Total 2	Ca 2	0
2	D	2	Total 2	Ca 2	0
2	E	2	Total 2	Ca 2	0
2	F	2	Total 2	Ca 2	0
2	G	2	Total 2	Ca 2	0
2	H	2	Total 2	Ca 2	0

- Molecule 3 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).



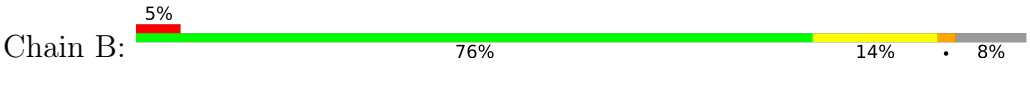
Mol	Chain	Residues	Atoms						AltConf
3	B	1	Total	C	H	N	O	P	0
			43	10	12	5	13	3	
3	C	1	Total	C	H	N	O	P	0
			43	10	12	5	13	3	
3	D	1	Total	C	H	N	O	P	0
			43	10	12	5	13	3	
3	E	1	Total	C	H	N	O	P	0
			43	10	12	5	13	3	
3	F	1	Total	C	H	N	O	P	0
			43	10	12	5	13	3	
3	G	1	Total	C	H	N	O	P	0
			43	10	12	5	13	3	
3	H	1	Total	C	H	N	O	P	0
			43	10	12	5	13	3	

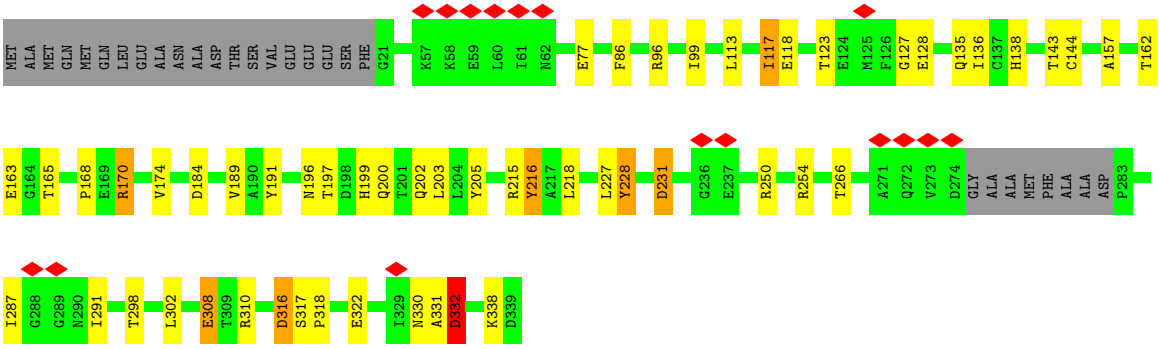
3 Residue-property plots (i)

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: DNA repair protein RAD51 homolog 1

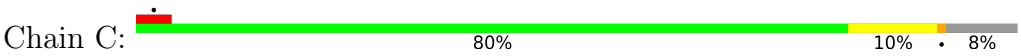
Chain B:

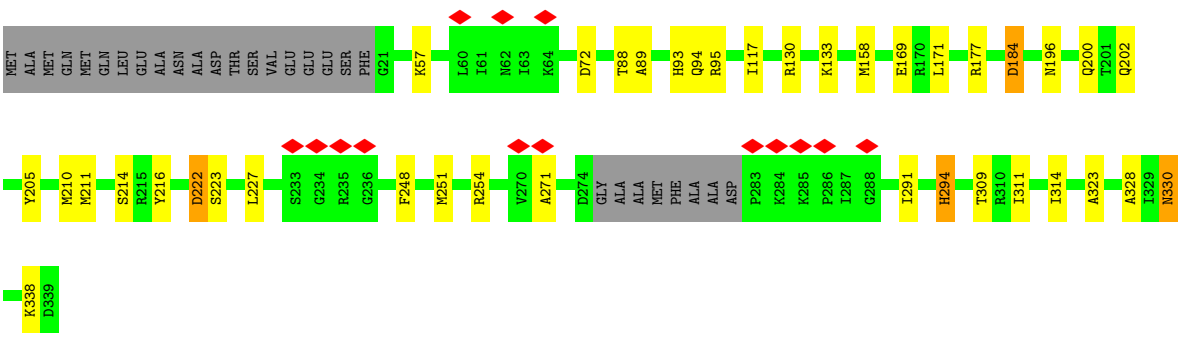




• Molecule 1: DNA repair protein RAD51 homolog 1

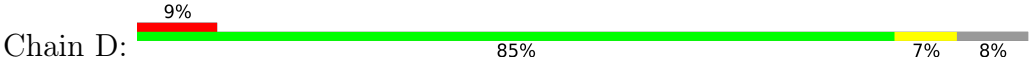
Chain C:

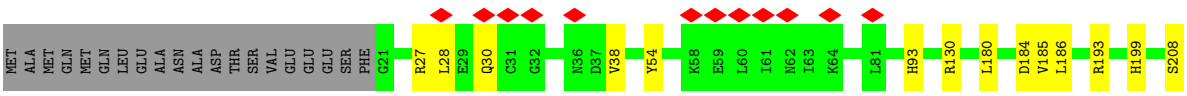


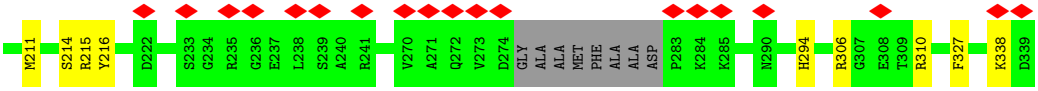


• Molecule 1: DNA repair protein RAD51 homolog 1

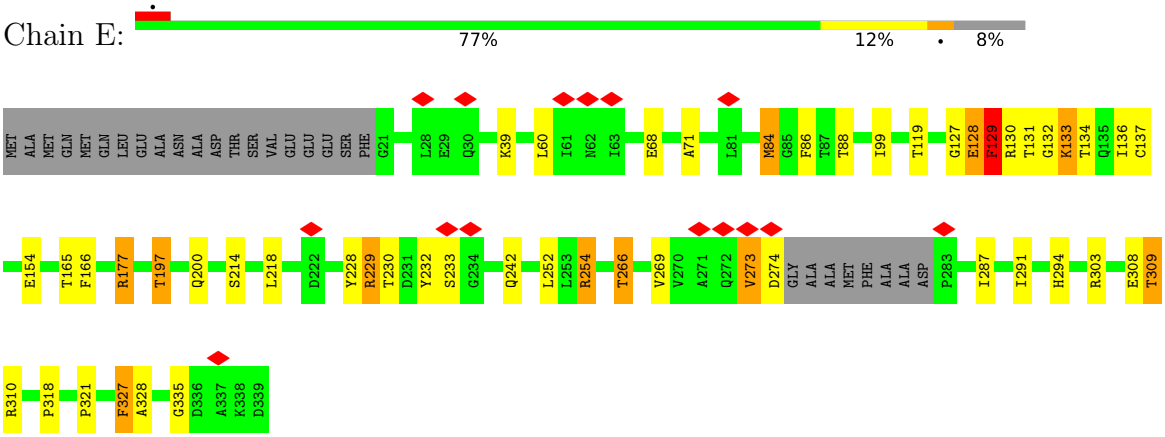
Chain D:



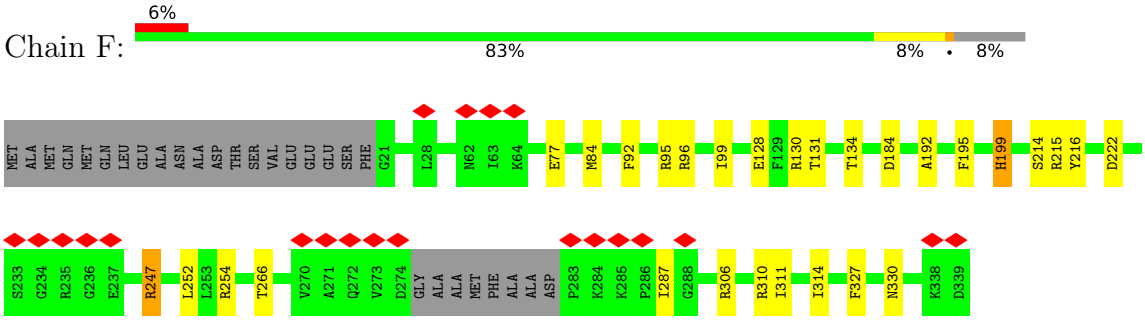




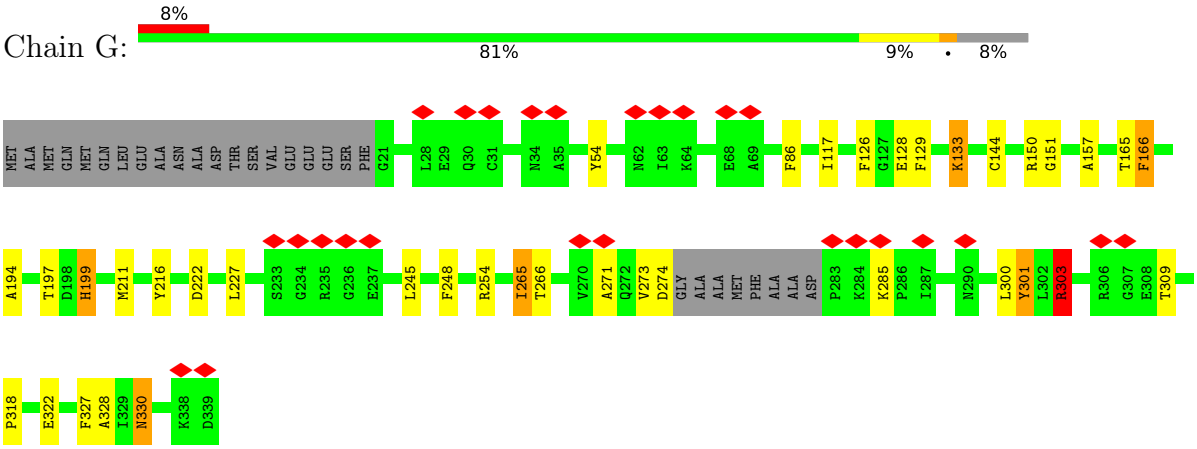
• Molecule 1: DNA repair protein RAD51 homolog 1



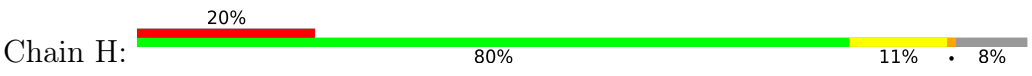
• Molecule 1: DNA repair protein RAD51 homolog 1

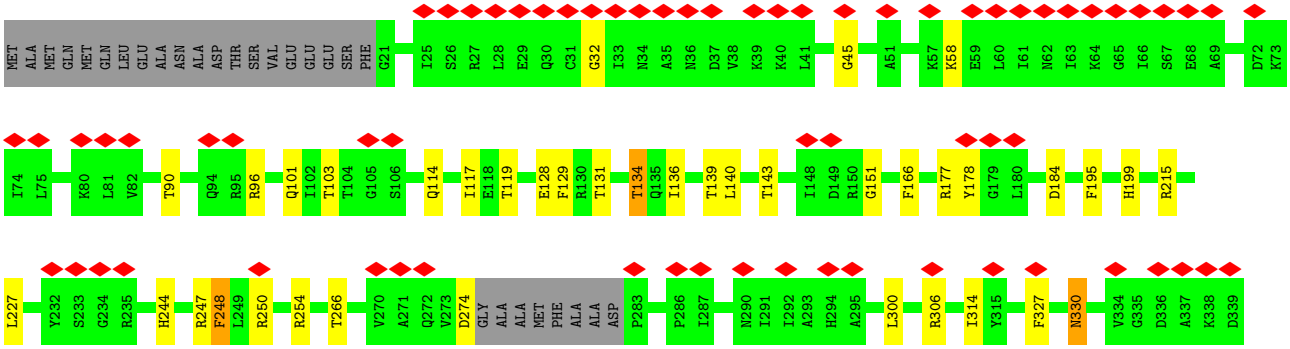


• Molecule 1: DNA repair protein RAD51 homolog 1



• Molecule 1: DNA repair protein RAD51 homolog 1




MET ALA MET GLN MET GLN LEU GLU ALA ASN ALA ASP THR SER VAL GLU GLU GLU SER PHE G21 I25 S26 R27 L28 E29 Q30 C31 G32 I33 N34 A35 N36 D37 V38 K39 K40 L41 G45 A51 K57 K58 E59 L60 I61 N62 I63 K64 G65 I66 S67 E68 A69 D72 K73
L74 L75 K80 L81 V82 T90 Q94 R95 R96 Q101 I102 T103 T104 G105 S106 Q114 I117 E118 T119 E128 F129 R130 T131 T134 Q135 I136 T139 L140 T143 I148 D149 R150 G151 F166 R177 Y178 G179 L180 D184 F195 H199 R215
L227 Y232 S233 G234 R235 H244 R247 F248 L249 R250 R254 T266 V270 A271 Q272 V273 D274 GLY ALA ALA MET PHE ALA ALA ASP P283 P286 I287 N290 I291 I292 A293 H294 A295 L300 R306 I314 Y315 F327 N330 V334 G335 D336 A337 K338 D339

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	295332	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	40	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	Not provided	
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	0.283	Depositor
Minimum map value	-0.080	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.007	Depositor
Recommended contour level	0.055	Depositor
Map size (Å)	426.8032, 426.8032, 426.8032	wwPDB
Map dimensions	512, 512, 512	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.8336, 0.8336, 0.8336	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CA, 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	B	0.83	0/2418	1.51	13/3258 (0.4%)
1	C	0.80	0/2418	1.40	6/3258 (0.2%)
1	D	0.75	0/2418	1.36	7/3258 (0.2%)
1	E	0.79	0/2418	1.42	10/3258 (0.3%)
1	F	0.77	0/2418	1.37	7/3258 (0.2%)
1	G	0.79	0/2418	1.36	7/3258 (0.2%)
1	H	0.80	0/2418	1.46	18/3258 (0.6%)
All	All	0.79	0/16926	1.41	68/22806 (0.3%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	4
1	C	0	2
1	D	0	2
1	E	0	7
1	F	0	3
1	G	0	5
1	H	0	1
All	All	0	24

There are no bond length outliers.

All (68) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	H	248	PHE	CA-CB-CG	9.54	123.34	113.80
1	E	129	PHE	N-CA-C	8.94	124.41	109.76

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	330	ASN	CA-CB-CG	8.37	120.97	112.60
1	G	330	ASN	CA-CB-CG	7.73	120.33	112.60
1	B	316	ASP	CA-CB-CG	7.36	119.96	112.60
1	B	331	ALA	CA-C-N	7.29	134.26	121.80
1	B	331	ALA	C-N-CA	7.29	134.26	121.80
1	B	332	ASP	CA-CB-CG	7.18	119.78	112.60
1	B	231	ASP	CA-CB-CG	6.98	119.58	112.60
1	H	250	ARG	NE-CZ-NH2	6.75	125.28	119.20
1	H	274	ASP	CA-CB-CG	6.58	119.18	112.60
1	B	135	GLN	CA-C-N	6.47	128.95	120.60
1	B	135	GLN	C-N-CA	6.47	128.95	120.60
1	E	291	ILE	CA-C-N	6.46	128.94	120.60
1	E	291	ILE	C-N-CA	6.46	128.94	120.60
1	F	306	ARG	NE-CZ-NH2	6.42	124.98	119.20
1	F	199	HIS	CB-CG-CD2	-6.26	123.06	131.20
1	D	185	VAL	CA-C-N	6.08	128.71	120.38
1	D	185	VAL	C-N-CA	6.08	128.71	120.38
1	G	271	ALA	N-CA-C	6.04	118.14	109.14
1	D	306	ARG	NE-CZ-NH2	5.84	124.45	119.20
1	H	248	PHE	N-CA-CB	-5.80	101.60	110.01
1	H	330	ASN	CA-CB-CG	5.75	118.35	112.60
1	C	271	ALA	N-CA-C	5.70	116.92	108.60
1	H	244	HIS	CB-CG-CD2	-5.70	123.80	131.20
1	E	214	SER	N-CA-C	5.61	117.37	108.79
1	B	118	GLU	N-CA-C	5.55	122.63	110.80
1	H	134	THR	CA-CB-OG1	5.54	117.91	109.60
1	G	222	ASP	CA-C-N	5.51	131.62	121.70
1	G	222	ASP	C-N-CA	5.51	131.62	121.70
1	H	306	ARG	NE-CZ-NH2	5.50	124.15	119.20
1	E	309	THR	N-CA-CB	5.47	118.05	110.17
1	B	138	HIS	CB-CG-CD2	-5.45	124.12	131.20
1	C	184	ASP	CA-CB-CG	5.45	118.05	112.60
1	B	135	GLN	OE1-CD-NE2	-5.39	117.21	122.60
1	H	247	ARG	CA-C-N	5.39	127.44	120.44
1	H	247	ARG	C-N-CA	5.39	127.44	120.44
1	D	294	HIS	CB-CG-CD2	-5.37	124.23	131.20
1	B	96	ARG	NE-CZ-NH2	5.36	124.02	119.20
1	D	215	ARG	NE-CZ-NH2	5.34	124.00	119.20
1	G	274	ASP	CA-CB-CG	5.33	117.93	112.60
1	G	150	ARG	NE-CZ-NH2	5.32	123.99	119.20
1	E	233	SER	N-CA-C	5.31	117.05	109.14
1	H	177	ARG	NE-CZ-NH2	5.27	123.94	119.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	E	131	THR	CA-C-O	-5.26	112.99	120.51
1	H	244	HIS	CA-C-N	5.23	127.72	120.29
1	H	244	HIS	C-N-CA	5.23	127.72	120.29
1	C	93	HIS	CA-CB-CG	-5.23	108.57	113.80
1	C	214	SER	N-CA-C	5.22	117.01	108.76
1	H	215	ARG	NE-CZ-NH2	5.22	123.90	119.20
1	H	101	GLN	OE1-CD-NE2	-5.18	117.42	122.60
1	C	323	ALA	N-CA-C	5.16	116.75	110.41
1	F	199	HIS	CA-C-N	5.15	127.49	120.54
1	F	199	HIS	C-N-CA	5.15	127.49	120.54
1	G	303	ARG	NE-CZ-NH2	5.13	123.82	119.20
1	F	222	ASP	CA-C-N	5.13	130.94	121.70
1	F	222	ASP	C-N-CA	5.13	130.94	121.70
1	D	199	HIS	CB-CG-CD2	-5.09	124.58	131.20
1	B	199	HIS	CB-CG-CD2	-5.07	124.61	131.20
1	E	218	LEU	N-CA-C	5.05	116.52	108.79
1	H	136	ILE	N-CA-C	-5.05	105.57	110.42
1	F	247	ARG	NE-CZ-NH2	5.04	123.74	119.20
1	D	27	ARG	NE-CZ-NH2	5.04	123.73	119.20
1	H	96	ARG	NE-CZ-NH2	5.03	123.73	119.20
1	B	254	ARG	NE-CZ-NH2	5.02	123.72	119.20
1	E	274	ASP	CA-CB-CG	5.02	117.62	112.60
1	H	199	HIS	CB-CG-CD2	-5.02	124.68	131.20
1	E	177	ARG	NE-CZ-NH2	5.01	123.71	119.20

There are no chirality outliers.

All (24) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	191	TYR	Sidechain
1	B	215	ARG	Sidechain
1	B	216	TYR	Sidechain
1	B	228	TYR	Sidechain
1	C	177	ARG	Sidechain
1	C	205	TYR	Sidechain
1	D	193	ARG	Sidechain
1	D	216	TYR	Sidechain
1	E	166	PHE	Sidechain
1	E	177	ARG	Sidechain
1	E	232	TYR	Sidechain
1	E	254	ARG	Sidechain
1	E	303	ARG	Sidechain,Peptide

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Mol	Chain	Res	Type	Group
1	E	310	ARG	Sidechain
1	F	215	ARG	Sidechain
1	F	216	TYR	Sidechain
1	F	96	ARG	Sidechain
1	G	166	PHE	Sidechain
1	G	254	ARG	Sidechain
1	G	301	TYR	Sidechain
1	G	303	ARG	Sidechain
1	G	86	PHE	Sidechain
1	H	166	PHE	Sidechain

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	B	2384	2407	2405	13	0
1	C	2384	2408	2405	7	0
1	D	2384	2407	2405	3	0
1	E	2384	2407	2405	21	0
1	F	2384	2407	2405	6	0
1	G	2384	2407	2406	12	0
1	H	2384	2407	2405	5	0
2	B	3	0	0	0	0
2	C	2	0	0	0	0
2	D	2	0	0	0	0
2	E	2	0	0	0	0
2	F	2	0	0	1	0
2	G	2	0	0	0	0
2	H	2	0	0	1	0
3	B	31	12	12	1	0
3	C	31	12	12	1	0
3	D	31	12	12	0	0
3	E	31	12	12	0	0
3	F	31	12	12	2	0
3	G	31	12	12	0	0
3	H	31	12	12	1	0
All	All	16920	16934	16920	62	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 2.

All (62) 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)
1:E:308:GLU:HG2	1:E:328:ALA:HB1	1.69	0.74
1:B:197:THR:HG22	1:B:228:TYR:CD1	2.28	0.69
1:E:133:LYS:HD2	1:E:266:THR:HB	1.77	0.66
1:E:129:PHE:CE1	1:E:133:LYS:HE2	2.31	0.65
2:F:401:CA:CA	3:F:403:ATP:O2G	1.74	0.64
2:H:401:CA:CA	3:H:403:ATP:O2G	1.73	0.63
1:B:144:CYS:SG	1:B:157:ALA:HB2	2.38	0.63
1:H:103:THR:HG22	1:H:151:GLY:HA3	1.81	0.63
1:B:157:ALA:HB3	1:B:189:VAL:HG22	1.82	0.61
1:E:133:LYS:HD2	1:E:266:THR:CB	2.31	0.60
1:E:309:THR:HG22	1:E:328:ALA:HB2	1.83	0.59
1:E:128:GLU:H	1:E:269:VAL:HG21	1.67	0.59
1:E:129:PHE:CZ	1:E:133:LYS:HE2	2.40	0.56
1:E:328:ALA:HB3	1:E:335:GLY:O	2.06	0.55
1:H:128:GLU:HG2	1:H:129:PHE:H	1.71	0.55
1:G:128:GLU:HA	1:G:133:LYS:HE3	1.91	0.53
1:B:197:THR:HG22	1:B:228:TYR:CE1	2.42	0.53
1:B:86:PHE:CD1	1:C:158:MET:HE1	2.44	0.53
1:E:129:PHE:CZ	1:E:133:LYS:CE	2.91	0.52
1:C:89:ALA:HB3	1:D:186:LEU:HA	1.92	0.50
1:C:133:LYS:HE2	3:C:403:ATP:O1B	2.11	0.50
1:C:309:THR:HA	1:C:328:ALA:HA	1.94	0.49
1:E:136:ILE:HD11	1:E:327:PHE:CE1	2.48	0.49
1:E:327:PHE:CD1	1:E:327:PHE:C	2.91	0.48
1:E:60:LEU:HD13	1:E:71:ALA:HB1	1.95	0.48
1:B:302:LEU:C	1:B:302:LEU:HD23	2.39	0.47
1:G:144:CYS:SG	1:G:157:ALA:HB2	2.54	0.47
1:B:308:GLU:H	1:B:308:GLU:CD	2.21	0.47
1:G:245:LEU:HA	1:G:248:PHE:CE2	2.50	0.47
1:B:170:ARG:HG2	3:B:404:ATP:C5	2.50	0.46
1:G:301:TYR:CE2	1:G:303:ARG:HA	2.50	0.46
1:B:330:ASN:C	1:B:332:ASP:H	2.24	0.46
1:H:139:THR:O	1:H:143:THR:HG23	2.15	0.46
1:B:302:LEU:HD21	1:B:310:ARG:HD2	1.97	0.46
1:D:310:ARG:HB2	1:D:327:PHE:CE2	2.51	0.45
1:F:84:MET:SD	1:G:199:HIS:CD2	3.10	0.45
1:E:229:ARG:HG3	1:E:287:ILE:HD12	1.97	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:202:GLN:HA	1:B:205:TYR:CD2	2.52	0.45
1:C:57:LYS:HZ3	1:C:72:ASP:CG	2.25	0.45
1:B:196:ASN:HA	1:B:227:LEU:HD13	1.99	0.44
1:E:129:PHE:CE1	1:E:133:LYS:CE	3.02	0.43
1:E:84:MET:HG2	1:F:199:HIS:HE2	1.84	0.42
1:E:99:ILE:HG23	1:E:119:THR:HB	2.00	0.42
1:G:194:ALA:HA	1:G:199:HIS:CE1	2.54	0.42
1:E:133:LYS:HG2	1:E:134:THR:N	2.34	0.42
1:E:197:THR:HB	1:E:228:TYR:CE1	2.55	0.42
1:G:265:ILE:HD12	1:G:266:THR:N	2.35	0.42
1:G:309:THR:HG22	1:G:328:ALA:CB	2.50	0.41
1:E:134:THR:HA	1:E:137:CYS:SG	2.61	0.41
1:B:127:GLY:HA3	1:B:302:LEU:HD22	2.03	0.41
1:E:321:PRO:HA	3:F:403:ATP:H2'	2.03	0.41
1:F:310:ARG:HB2	1:F:327:PHE:CE2	2.55	0.41
1:G:197:THR:HG23	1:G:227:LEU:HB3	2.01	0.41
1:D:208:SER:HA	1:D:211:MET:SD	2.61	0.41
1:C:222:ASP:HA	1:C:223:SER:HA	1.85	0.40
1:G:54:TYR:CE1	1:H:195:PHE:CD1	3.09	0.40
1:F:195:PHE:CD2	1:F:199:HIS:CE1	3.09	0.40
1:G:211:MET:HA	1:G:216:TYR:CE1	2.56	0.40
1:C:291:ILE:HA	1:C:294:HIS:CD2	2.57	0.40
1:E:86:PHE:CZ	1:F:192:ALA:HB3	2.56	0.40
1:H:128:GLU:HB3	1:H:131:THR:HG21	2.03	0.40
1:F:92:PHE:CD2	1:G:166:PHE:CD2	3.10	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	B	307/339 (91%)	267 (87%)	35 (11%)	5 (2%)	7 37

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	C	307/339 (91%)	279 (91%)	27 (9%)	1 (0%)	36 72
1	D	307/339 (91%)	288 (94%)	19 (6%)	0	100 100
1	E	307/339 (91%)	281 (92%)	21 (7%)	5 (2%)	7 37
1	F	307/339 (91%)	288 (94%)	18 (6%)	1 (0%)	36 72
1	G	307/339 (91%)	281 (92%)	22 (7%)	4 (1%)	9 42
1	H	307/339 (91%)	288 (94%)	17 (6%)	2 (1%)	18 56
All	All	2149/2373 (91%)	1972 (92%)	159 (7%)	18 (1%)	18 54

All (18) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	174	VAL
1	E	273	VAL
1	G	322	GLU
1	B	168	PRO
1	B	318	PRO
1	E	318	PRO
1	E	132	GLY
1	E	154	GLU
1	G	318	PRO
1	H	45	GLY
1	C	314	ILE
1	B	117	ILE
1	E	127	GLY
1	G	151	GLY
1	H	32	GLY
1	F	314	ILE
1	G	273	VAL
1	B	317	SER

5.3.2 Protein sidechains (i)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	B	249/269 (93%)	221 (89%)	28 (11%)	6 19
1	C	249/269 (93%)	226 (91%)	23 (9%)	8 27
1	D	249/269 (93%)	239 (96%)	10 (4%)	28 49
1	E	249/269 (93%)	229 (92%)	20 (8%)	11 31
1	F	249/269 (93%)	233 (94%)	16 (6%)	16 37
1	G	249/269 (93%)	238 (96%)	11 (4%)	25 47
1	H	249/269 (93%)	232 (93%)	17 (7%)	14 36
All	All	1743/1883 (93%)	1618 (93%)	125 (7%)	15 35

All (125) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	77	GLU
1	B	99	ILE
1	B	113	LEU
1	B	117	ILE
1	B	123	THR
1	B	128	GLU
1	B	136	ILE
1	B	143	THR
1	B	162	THR
1	B	163	GLU
1	B	165	THR
1	B	170	ARG
1	B	184	ASP
1	B	200	GLN
1	B	203	LEU
1	B	216	TYR
1	B	218	LEU
1	B	231	ASP
1	B	250	ARG
1	B	266	THR
1	B	287	ILE
1	B	291	ILE
1	B	298	THR
1	B	308	GLU
1	B	316	ASP
1	B	322	GLU
1	B	332	ASP
1	B	338	LYS
1	C	88	THR

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Mol	Chain	Res	Type
1	C	94	GLN
1	C	95	ARG
1	C	117	ILE
1	C	130	ARG
1	C	169	GLU
1	C	171	LEU
1	C	184	ASP
1	C	196	ASN
1	C	200	GLN
1	C	202	GLN
1	C	210	MET
1	C	211	MET
1	C	216	TYR
1	C	222	ASP
1	C	227	LEU
1	C	248	PHE
1	C	251	MET
1	C	254	ARG
1	C	294	HIS
1	C	311	ILE
1	C	330	ASN
1	C	338	LYS
1	D	28	LEU
1	D	30	GLN
1	D	38	VAL
1	D	54	TYR
1	D	93	HIS
1	D	130	ARG
1	D	180	LEU
1	D	184	ASP
1	D	214	SER
1	D	338	LYS
1	E	39	LYS
1	E	68	GLU
1	E	84	MET
1	E	88	THR
1	E	128	GLU
1	E	129	PHE
1	E	130	ARG
1	E	133	LYS
1	E	165	THR
1	E	197	THR

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Mol	Chain	Res	Type
1	E	200	GLN
1	E	229	ARG
1	E	230	THR
1	E	242	GLN
1	E	252	LEU
1	E	254	ARG
1	E	266	THR
1	E	273	VAL
1	E	294	HIS
1	E	327	PHE
1	F	77	GLU
1	F	95	ARG
1	F	99	ILE
1	F	128	GLU
1	F	130	ARG
1	F	131	THR
1	F	134	THR
1	F	184	ASP
1	F	214	SER
1	F	247	ARG
1	F	252	LEU
1	F	254	ARG
1	F	266	THR
1	F	287	ILE
1	F	311	ILE
1	F	330	ASN
1	G	117	ILE
1	G	126	PHE
1	G	129	PHE
1	G	133	LYS
1	G	165	THR
1	G	199	HIS
1	G	265	ILE
1	G	285	LYS
1	G	300	LEU
1	G	327	PHE
1	G	330	ASN
1	H	58	LYS
1	H	90	THR
1	H	114	GLN
1	H	117	ILE
1	H	119	THR

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Mol	Chain	Res	Type
1	H	134	THR
1	H	140	LEU
1	H	178	TYR
1	H	184	ASP
1	H	227	LEU
1	H	248	PHE
1	H	254	ARG
1	H	266	THR
1	H	300	LEU
1	H	314	ILE
1	H	327	PHE
1	H	330	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (24) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	94	GLN
1	B	188	ASN
1	B	206	GLN
1	B	294	HIS
1	C	94	GLN
1	C	188	ASN
1	C	200	GLN
1	C	290	ASN
1	D	188	ASN
1	D	199	HIS
1	D	294	HIS
1	D	330	ASN
1	E	188	ASN
1	E	272	GLN
1	E	290	ASN
1	F	188	ASN
1	G	202	GLN
1	G	206	GLN
1	G	290	ASN
1	G	294	HIS
1	H	30	GLN
1	H	62	ASN
1	H	135	GLN
1	H	206	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 22 ligands modelled in this entry, 15 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	$\#\|Z\| > 2$
3	ATP	H	403	-	29,33,33	1.00	1 (3%)	44,52,52	1.57	9 (20%)
3	ATP	B	404	2	29,33,33	1.05	0	44,52,52	1.40	7 (15%)
3	ATP	D	403	2	29,33,33	1.03	0	44,52,52	1.53	7 (15%)
3	ATP	C	403	2	29,33,33	1.05	0	44,52,52	1.44	7 (15%)
3	ATP	G	403	2	29,33,33	1.01	0	44,52,52	1.49	7 (15%)
3	ATP	E	403	2	29,33,33	1.03	1 (3%)	44,52,52	1.53	9 (20%)
3	ATP	F	403	-	29,33,33	1.03	0	44,52,52	1.52	5 (11%)

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
3	ATP	H	403	-	-	6/22/38/38	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	ATP	B	404	2	-	6/22/38/38	0/3/3/3
3	ATP	D	403	2	-	3/22/38/38	0/3/3/3
3	ATP	C	403	2	-	9/22/38/38	0/3/3/3
3	ATP	G	403	2	-	3/22/38/38	0/3/3/3
3	ATP	E	403	2	-	5/22/38/38	0/3/3/3
3	ATP	F	403	-	-	6/22/38/38	0/3/3/3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	H	403	ATP	C8-N7	2.02	1.35	1.31
3	E	403	ATP	PG-O3G	-2.02	1.47	1.54

All (51) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	D	403	ATP	PA-O3A-PB	-4.69	116.72	132.83
3	F	403	ATP	PA-O3A-PB	-4.44	117.59	132.83
3	F	403	ATP	PB-O3B-PG	-4.28	118.12	132.83
3	G	403	ATP	PA-O3A-PB	-4.19	118.46	132.83
3	C	403	ATP	PA-O3A-PB	-4.13	118.66	132.83
3	H	403	ATP	PB-O3B-PG	-4.06	118.88	132.83
3	D	403	ATP	PB-O3B-PG	-4.05	118.94	132.83
3	G	403	ATP	PB-O3B-PG	-3.97	119.19	132.83
3	E	403	ATP	PA-O3A-PB	-3.91	119.39	132.83
3	B	404	ATP	PA-O3A-PB	-3.82	119.73	132.83
3	E	403	ATP	PB-O3B-PG	-3.78	119.85	132.83
3	C	403	ATP	O2G-PG-O3B	3.37	115.94	104.64
3	H	403	ATP	PA-O3A-PB	-3.33	121.41	132.83
3	B	404	ATP	PB-O3B-PG	-3.25	121.66	132.83
3	H	403	ATP	O4'-C1'-N9	3.02	114.01	108.06
3	C	403	ATP	PB-O3B-PG	-3.02	122.47	132.83
3	B	404	ATP	C5-C4-N3	-2.94	122.91	126.75
3	H	403	ATP	O2G-PG-O3B	2.93	114.47	104.64
3	E	403	ATP	C5-C4-N3	-2.91	122.95	126.75
3	G	403	ATP	C4-C5-N7	2.90	114.14	110.62
3	H	403	ATP	C4'-O4'-C1'	-2.81	103.28	109.47
3	E	403	ATP	C4-C5-N7	2.80	114.03	110.62
3	D	403	ATP	C5-C4-N3	-2.78	123.12	126.75
3	F	403	ATP	C4-C5-N7	2.77	114.00	110.62
3	C	403	ATP	C5-C4-N3	-2.76	123.16	126.75

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	F	403	ATP	C5-C4-N3	-2.72	123.21	126.75
3	D	403	ATP	C4-C5-N7	2.65	113.85	110.62
3	G	403	ATP	C5-C4-N3	-2.63	123.32	126.75
3	G	403	ATP	O4'-C1'-C2'	-2.61	100.95	106.64
3	H	403	ATP	C5-C4-N3	-2.59	123.37	126.75
3	E	403	ATP	C5-C6-N1	2.58	122.94	117.39
3	E	403	ATP	O3G-PG-O3B	2.55	113.19	104.64
3	B	404	ATP	C4-C5-N7	2.54	113.72	110.62
3	C	403	ATP	C4-C5-N7	2.53	113.69	110.62
3	H	403	ATP	C5-C6-N1	2.52	122.79	117.39
3	G	403	ATP	C5-C6-N1	2.49	122.75	117.39
3	D	403	ATP	C5-C6-N1	2.44	122.62	117.39
3	E	403	ATP	O4'-C1'-C2'	-2.41	101.38	106.64
3	D	403	ATP	O4'-C1'-C2'	-2.40	101.40	106.64
3	H	403	ATP	C4-C5-N7	2.38	113.52	110.62
3	F	403	ATP	C5-C6-N1	2.33	122.39	117.39
3	C	403	ATP	C5-C6-N1	2.31	122.34	117.39
3	B	404	ATP	C5-C6-N1	2.30	122.34	117.39
3	E	403	ATP	N3-C4-N9	2.24	130.78	127.08
3	C	403	ATP	N3-C4-N9	2.24	130.77	127.08
3	B	404	ATP	O2G-PG-O3B	2.17	111.92	104.64
3	H	403	ATP	N6-C6-N1	-2.13	113.68	118.35
3	G	403	ATP	N3-C4-N9	2.11	130.56	127.08
3	D	403	ATP	N3-C4-N9	2.10	130.55	127.08
3	B	404	ATP	N3-C4-N9	2.04	130.44	127.08
3	E	403	ATP	C2-N1-C6	-2.04	115.27	118.77

There are no chirality outliers.

All (38) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	404	ATP	C5'-O5'-PA-O2A
3	B	404	ATP	C5'-O5'-PA-O3A
3	B	404	ATP	C4'-C5'-O5'-PA
3	B	404	ATP	C3'-C4'-C5'-O5'
3	C	403	ATP	PB-O3B-PG-O2G
3	C	403	ATP	C5'-O5'-PA-O1A
3	F	403	ATP	C5'-O5'-PA-O1A
3	F	403	ATP	C5'-O5'-PA-O2A
3	G	403	ATP	C5'-O5'-PA-O1A
3	H	403	ATP	C5'-O5'-PA-O1A
3	B	404	ATP	O4'-C4'-C5'-O5'

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Mol	Chain	Res	Type	Atoms
3	H	403	ATP	C3'-C4'-C5'-O5'
3	C	403	ATP	C3'-C4'-C5'-O5'
3	H	403	ATP	O4'-C4'-C5'-O5'
3	C	403	ATP	O4'-C4'-C5'-O5'
3	C	403	ATP	C5'-O5'-PA-O3A
3	G	403	ATP	C5'-O5'-PA-O3A
3	H	403	ATP	C5'-O5'-PA-O3A
3	E	403	ATP	PG-O3B-PB-O1B
3	D	403	ATP	C2'-C1'-N9-C8
3	C	403	ATP	C5'-O5'-PA-O2A
3	G	403	ATP	C5'-O5'-PA-O2A
3	H	403	ATP	C5'-O5'-PA-O2A
3	C	403	ATP	PA-O3A-PB-O2B
3	D	403	ATP	PB-O3A-PA-O2A
3	B	404	ATP	PB-O3B-PG-O1G
3	C	403	ATP	PG-O3B-PB-O1B
3	D	403	ATP	PG-O3B-PB-O1B
3	F	403	ATP	PG-O3B-PB-O2B
3	F	403	ATP	PA-O3A-PB-O1B
3	C	403	ATP	PB-O3B-PG-O3G
3	F	403	ATP	C5'-O5'-PA-O3A
3	E	403	ATP	PG-O3B-PB-O2B
3	E	403	ATP	PA-O3A-PB-O1B
3	E	403	ATP	PA-O3A-PB-O2B
3	F	403	ATP	PG-O3B-PB-O1B
3	H	403	ATP	PG-O3B-PB-O1B
3	E	403	ATP	C5'-O5'-PA-O2A

There are no ring outliers.

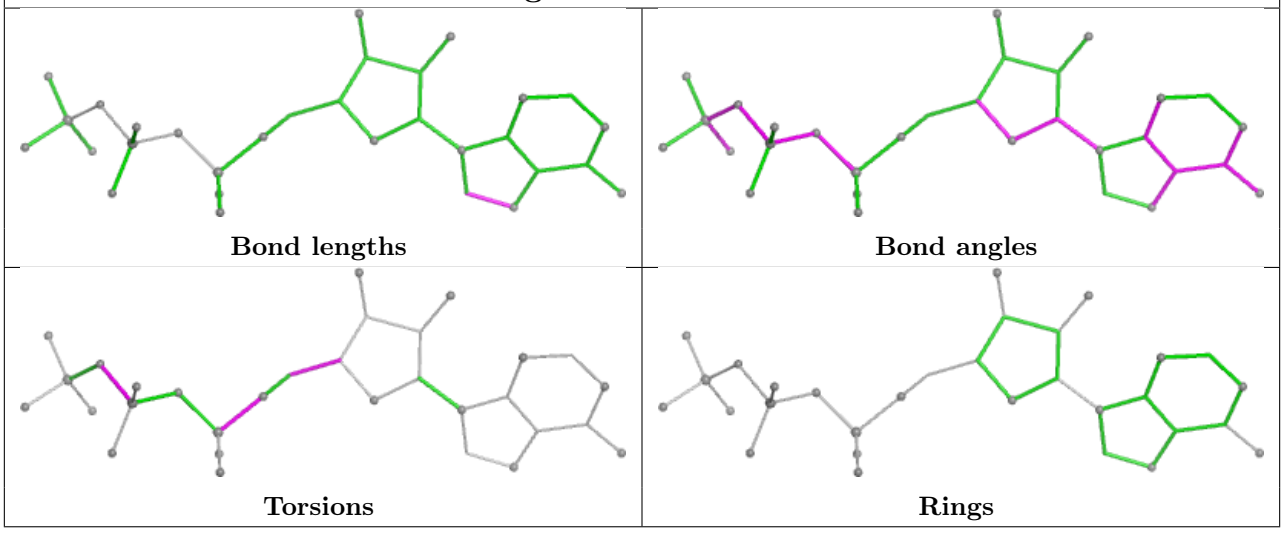
4 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	H	403	ATP	1	0
3	B	404	ATP	1	0
3	C	403	ATP	1	0
3	F	403	ATP	2	0

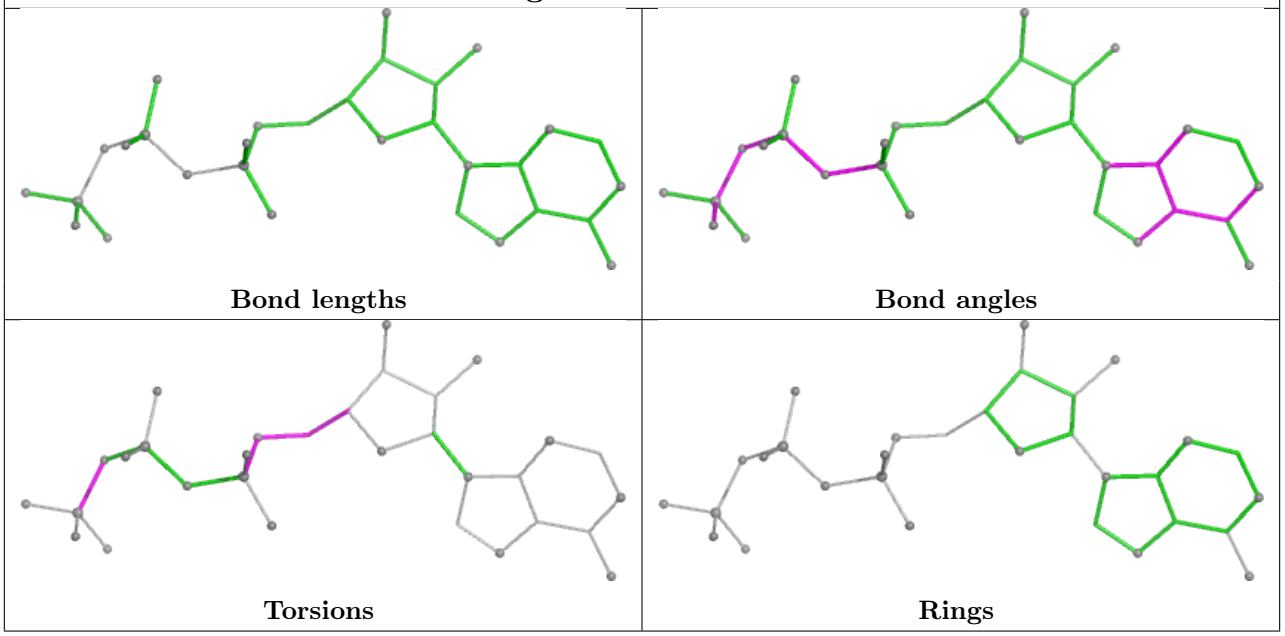
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

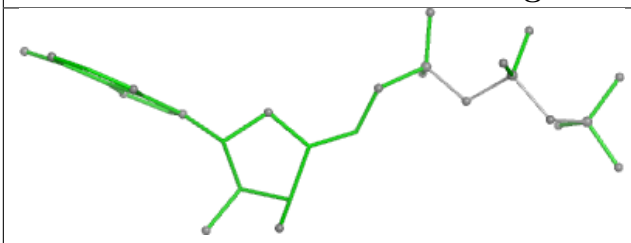
Ligand ATP H 403



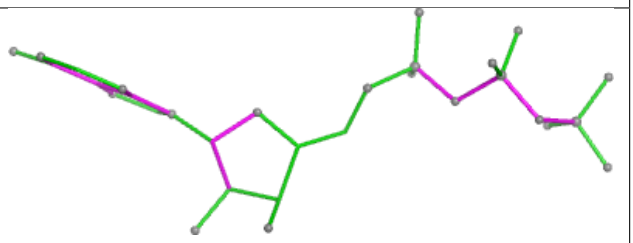
Ligand ATP B 404



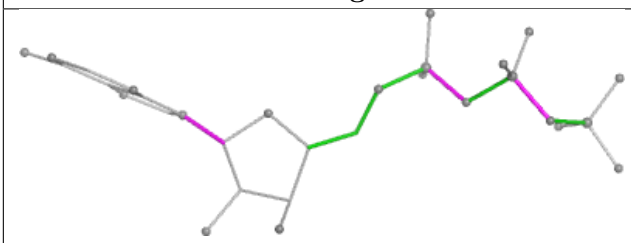
Ligand ATP D 403



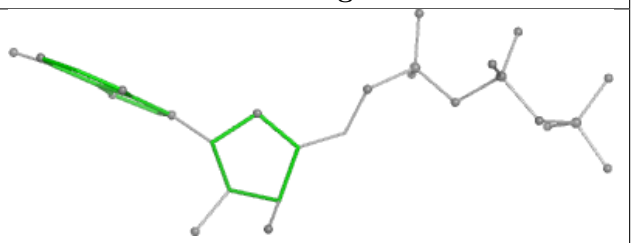
Bond lengths



Bond angles

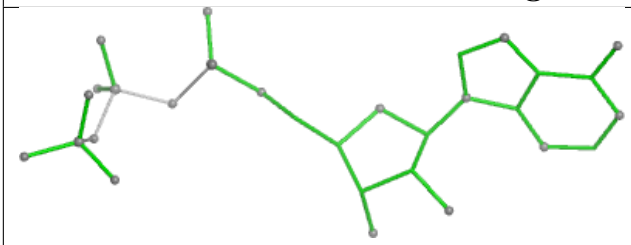


Torsions

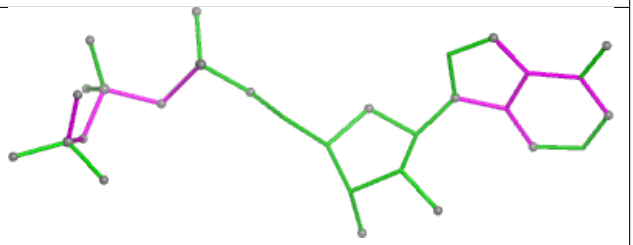


Rings

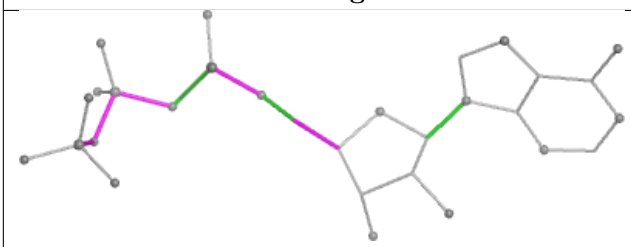
Ligand ATP C 403



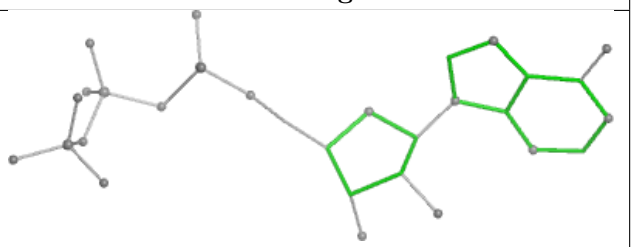
Bond lengths



Bond angles

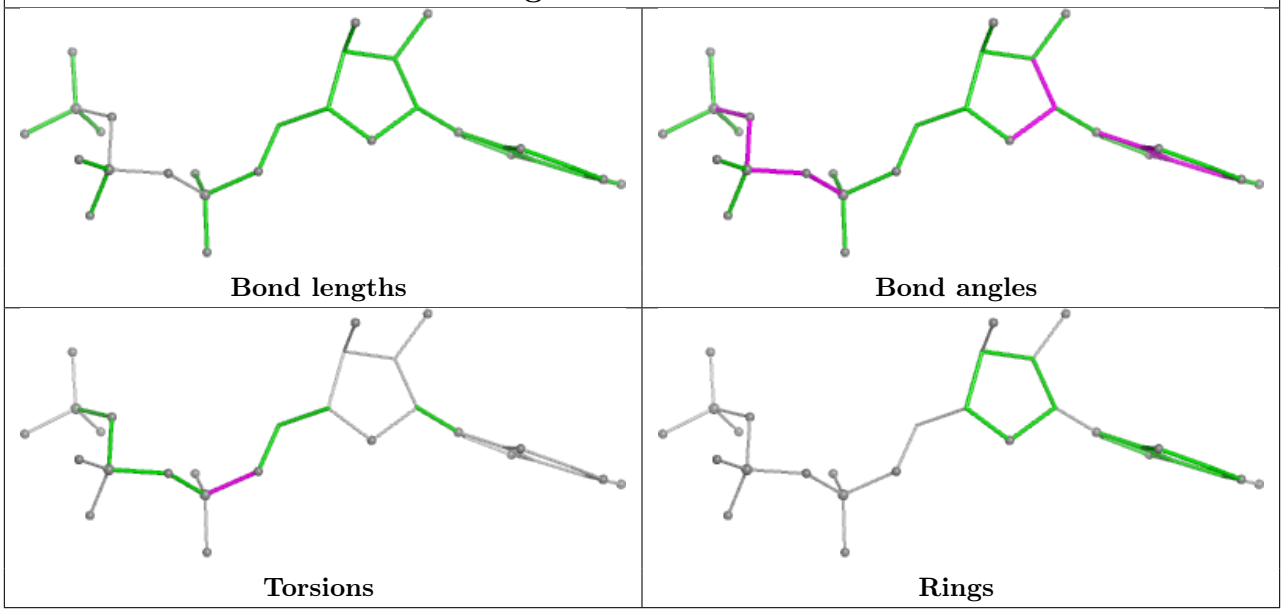


Torsions

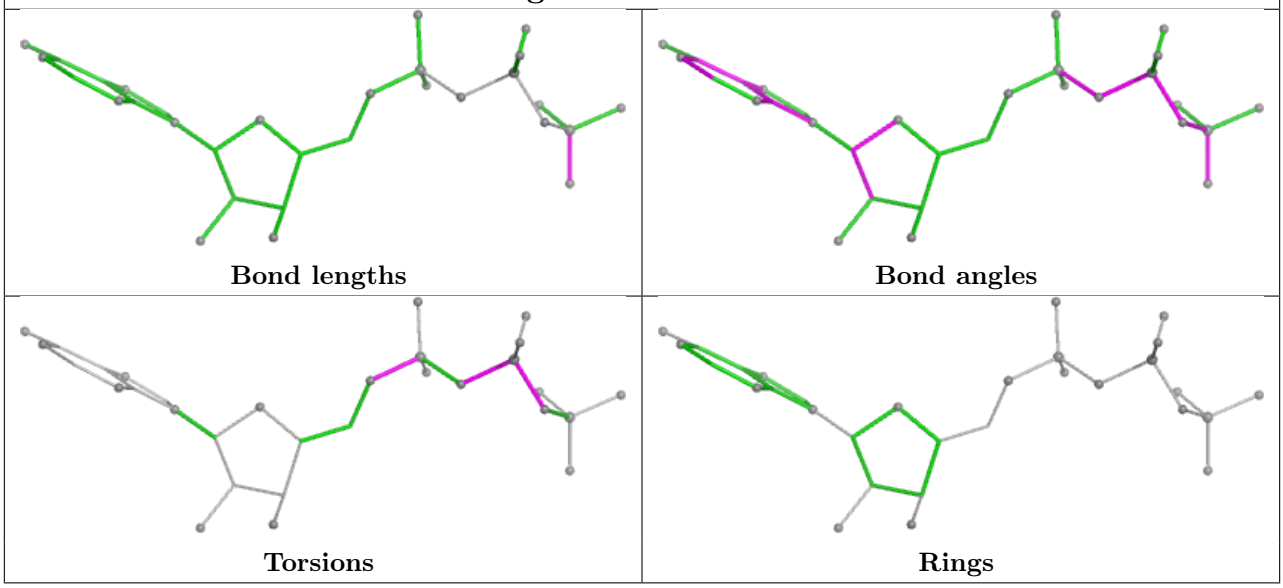


Rings

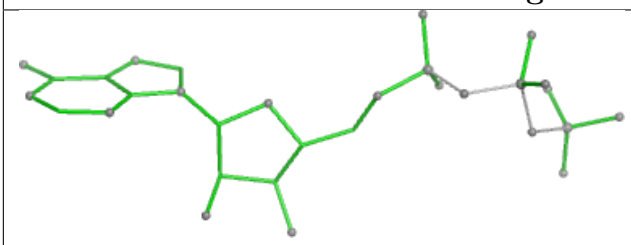
Ligand ATP G 403



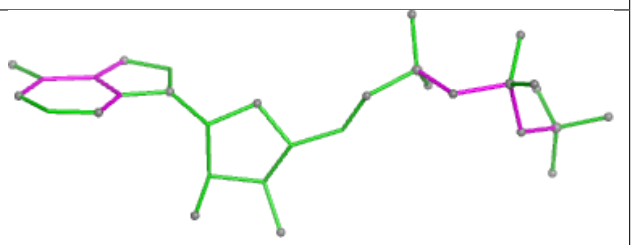
Ligand ATP E 403



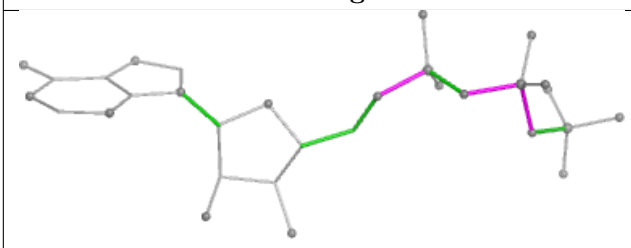
Ligand ATP F 403



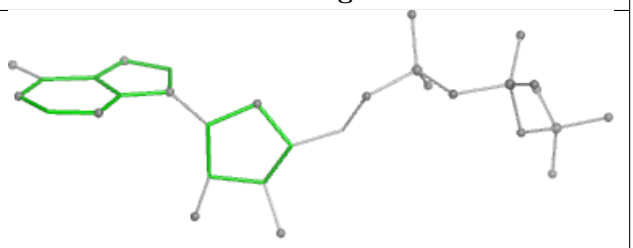
Bond lengths



Bond angles



Torsions



Rings

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.

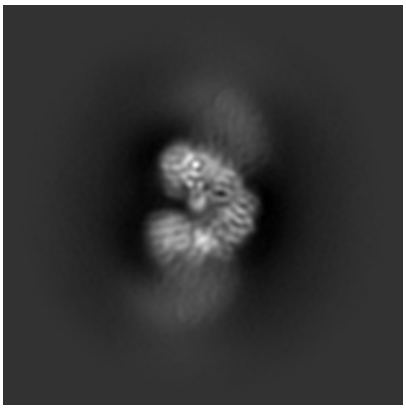
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-52848. These allow visual inspection of the internal detail of the map and identification of artifacts.

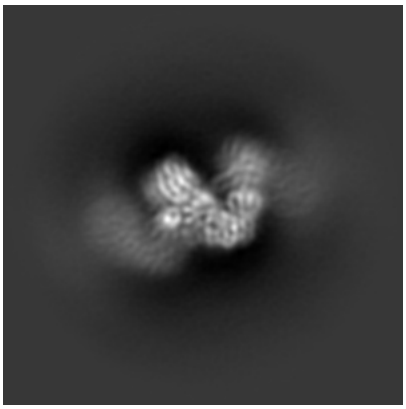
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

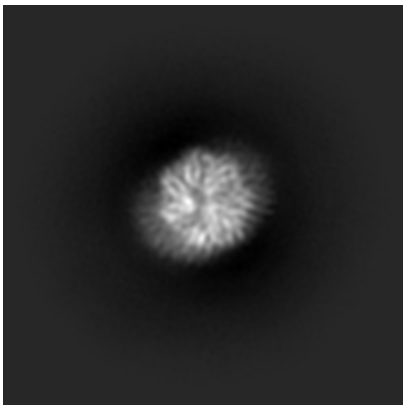
6.1.1 Primary map



X

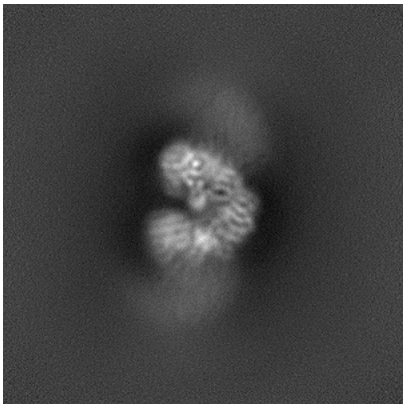


Y

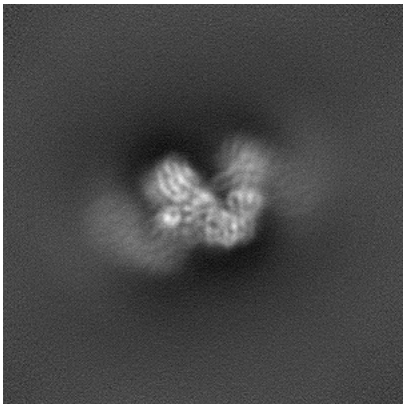


Z

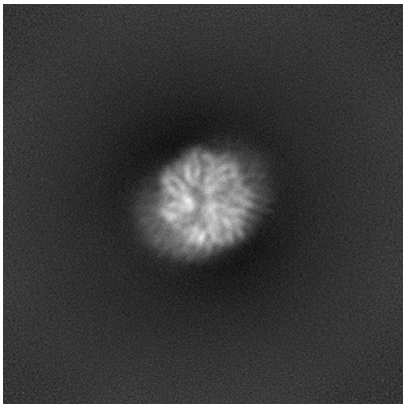
6.1.2 Raw map



X



Y



Z

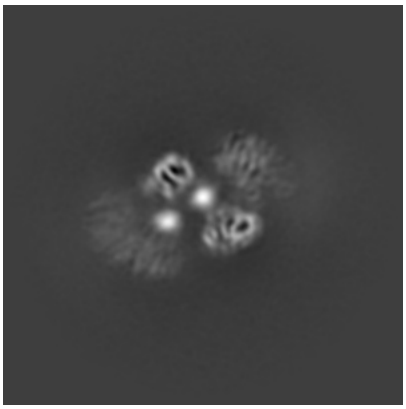
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

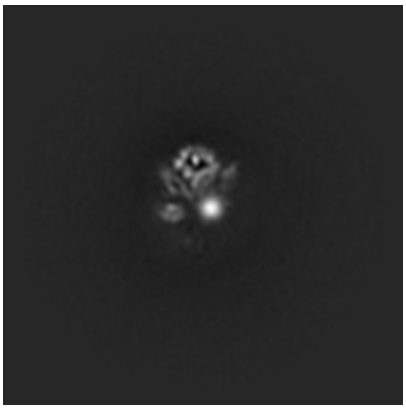
6.2.1 Primary map



X Index: 256

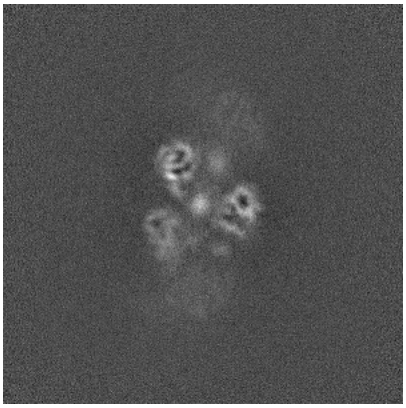


Y Index: 256

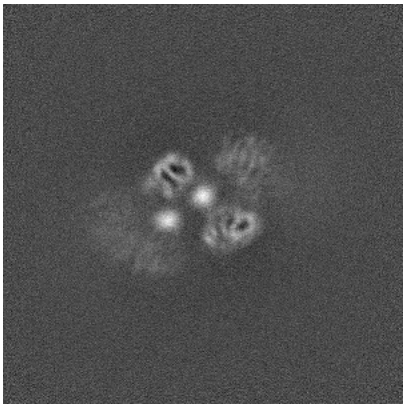


Z Index: 256

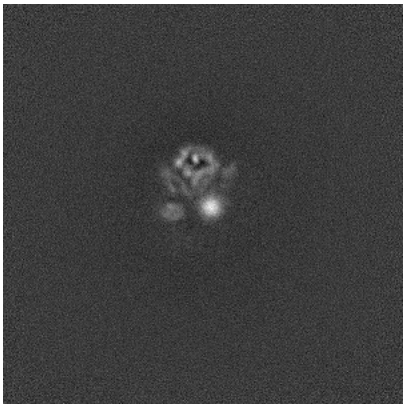
6.2.2 Raw map



X Index: 256



Y Index: 256

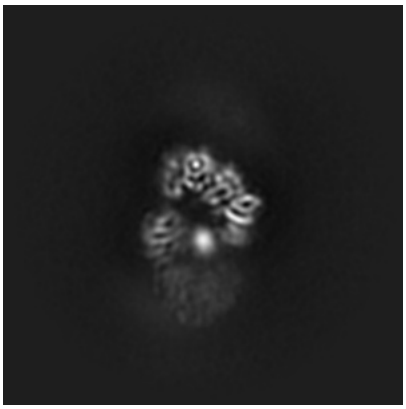


Z Index: 256

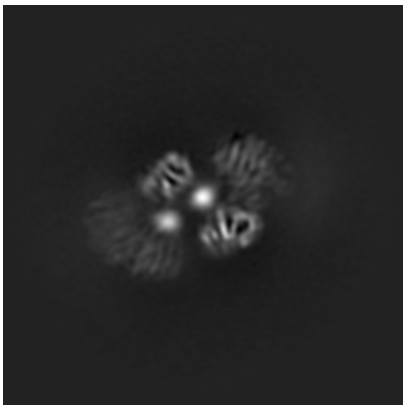
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

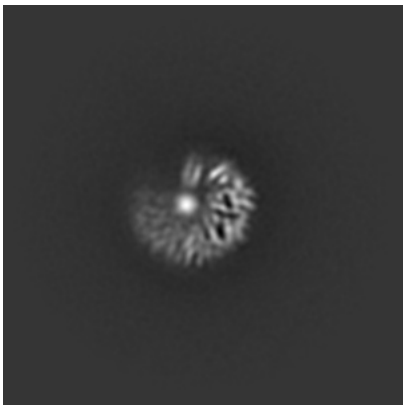
6.3.1 Primary map



X Index: 236

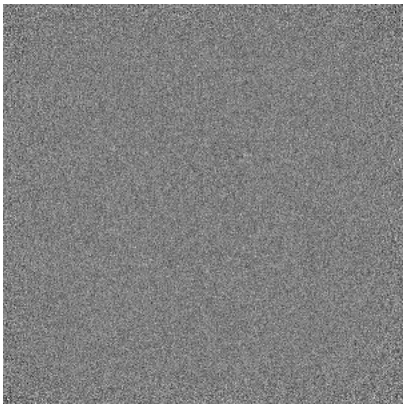


Y Index: 253

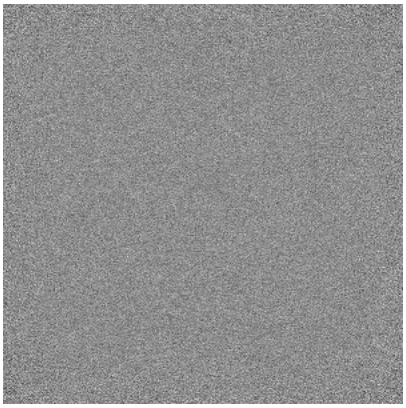


Z Index: 211

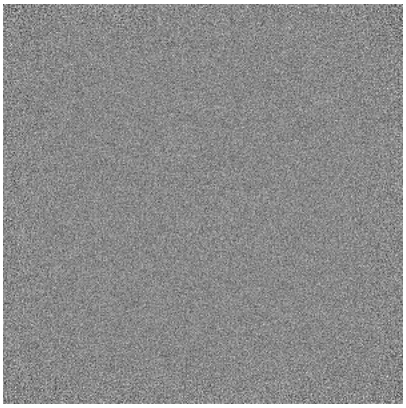
6.3.2 Raw map



X Index: 0



Y Index: 0

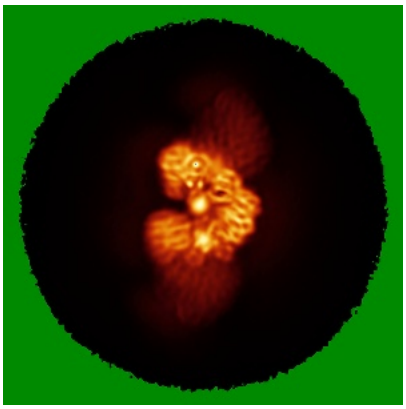


Z Index: 511

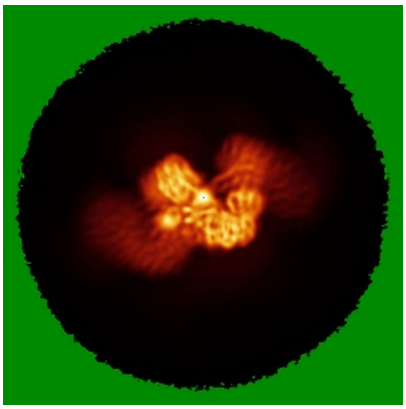
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map



X

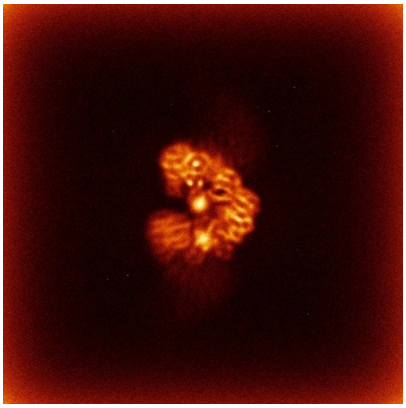


Y

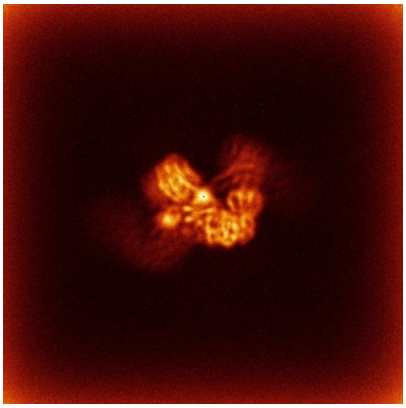


Z

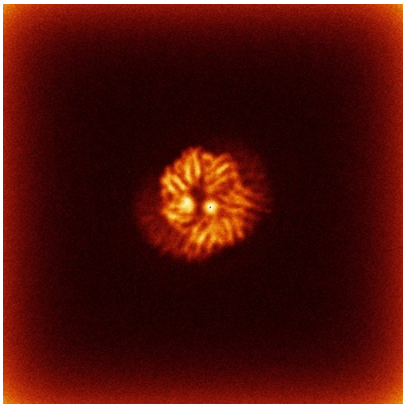
6.4.2 Raw map



X



Y

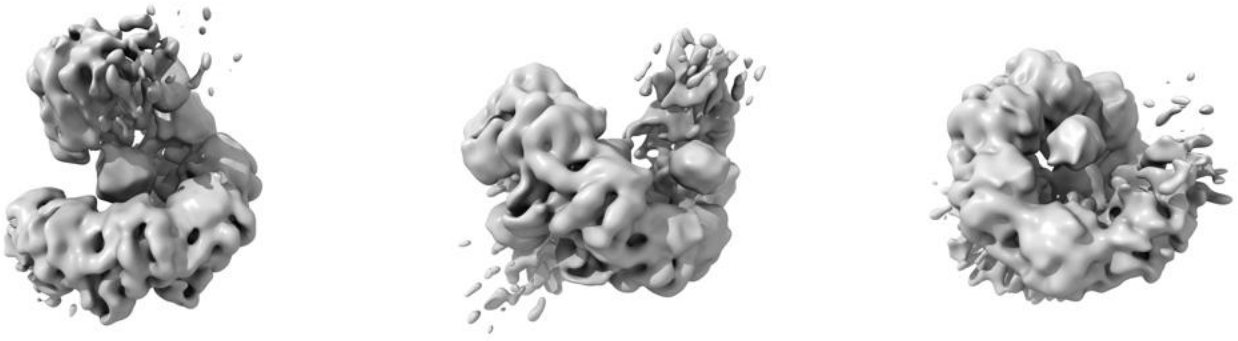


Z

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 0.055. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



X Y Z

These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

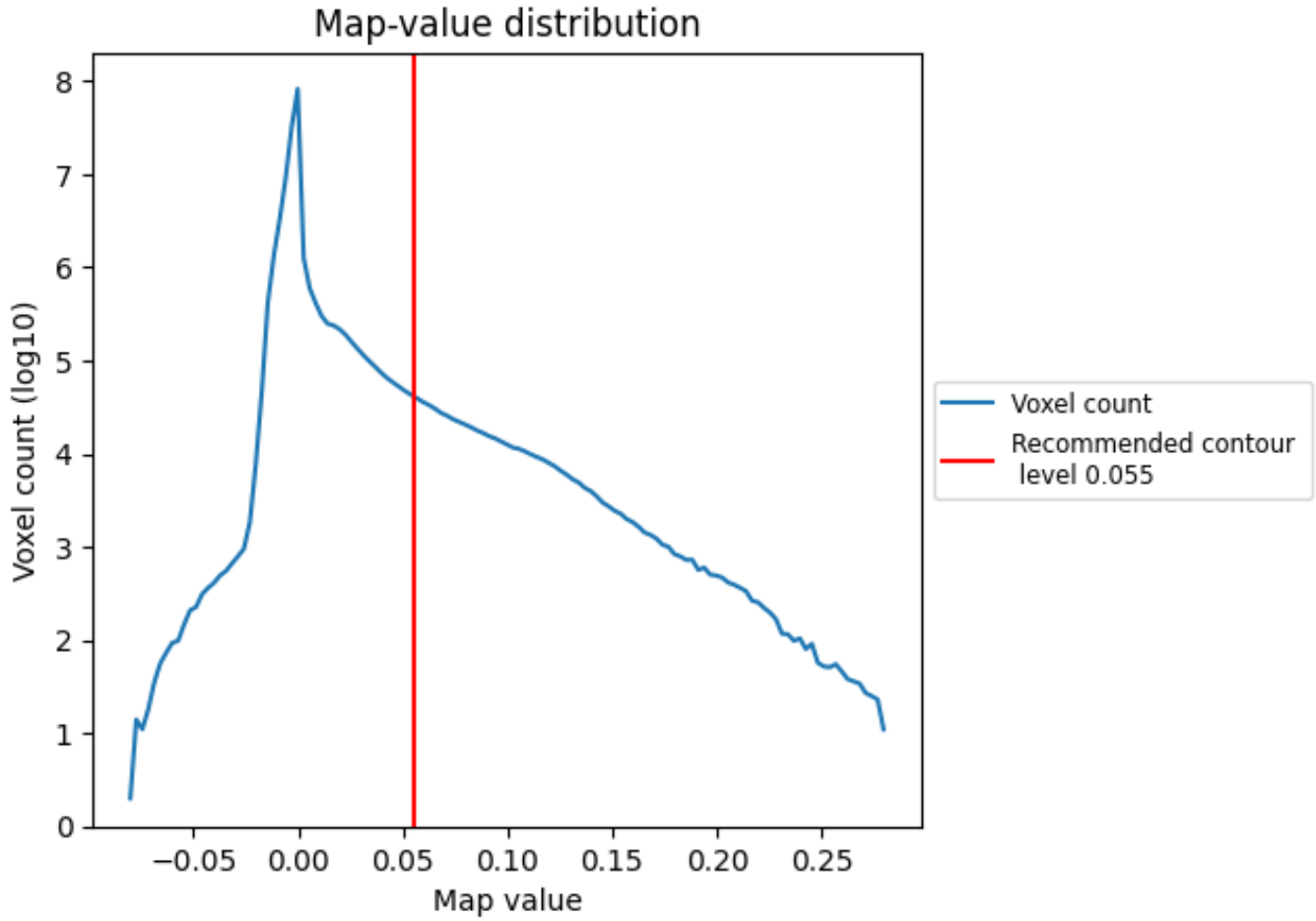
6.6 Mask visualisation (i)

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

7 Map analysis

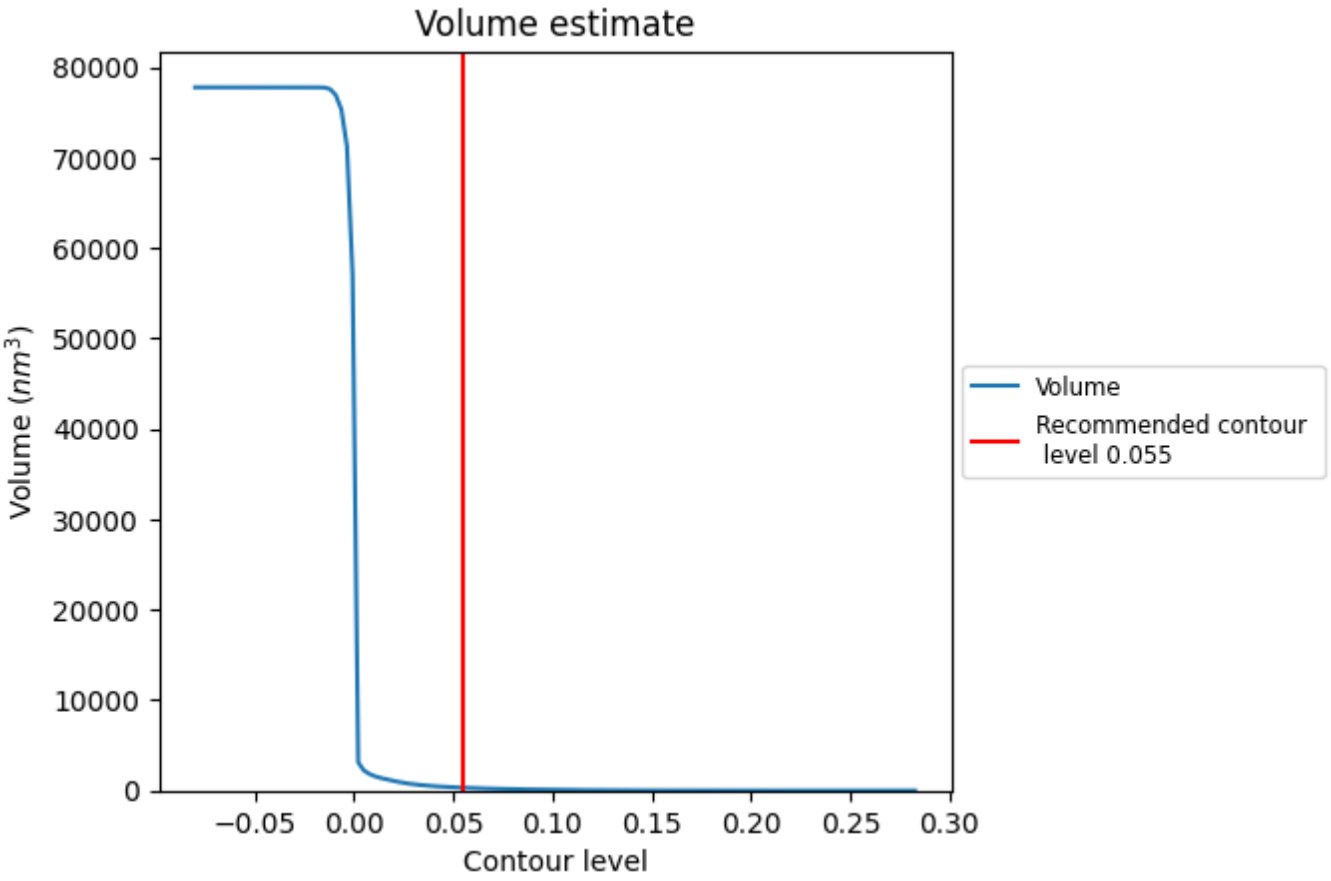
This section contains the results of statistical analysis of the map.

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.

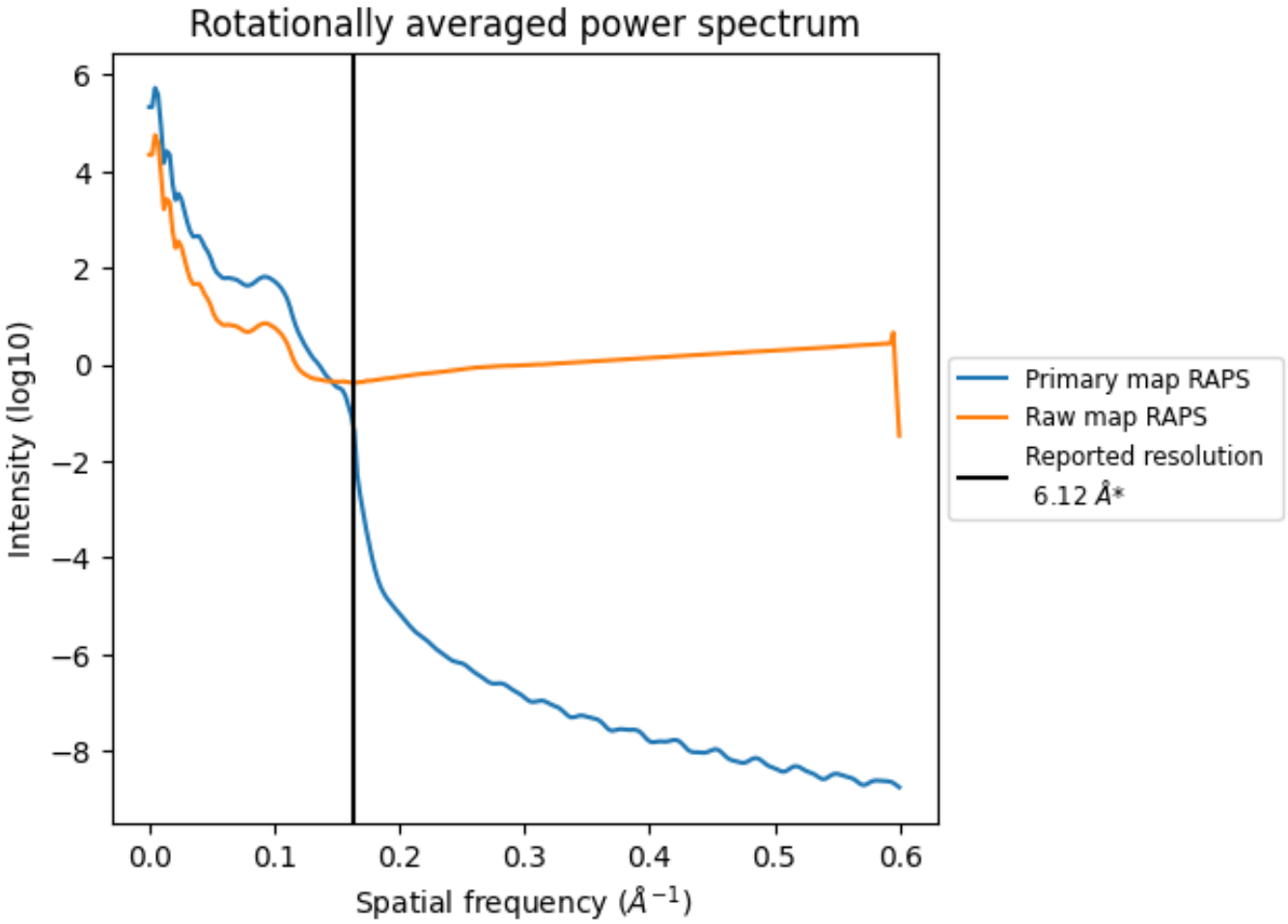
7.2 Volume estimate



The volume at the recommended contour level is 312 nm^3; this corresponds to an approximate mass of 282 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)

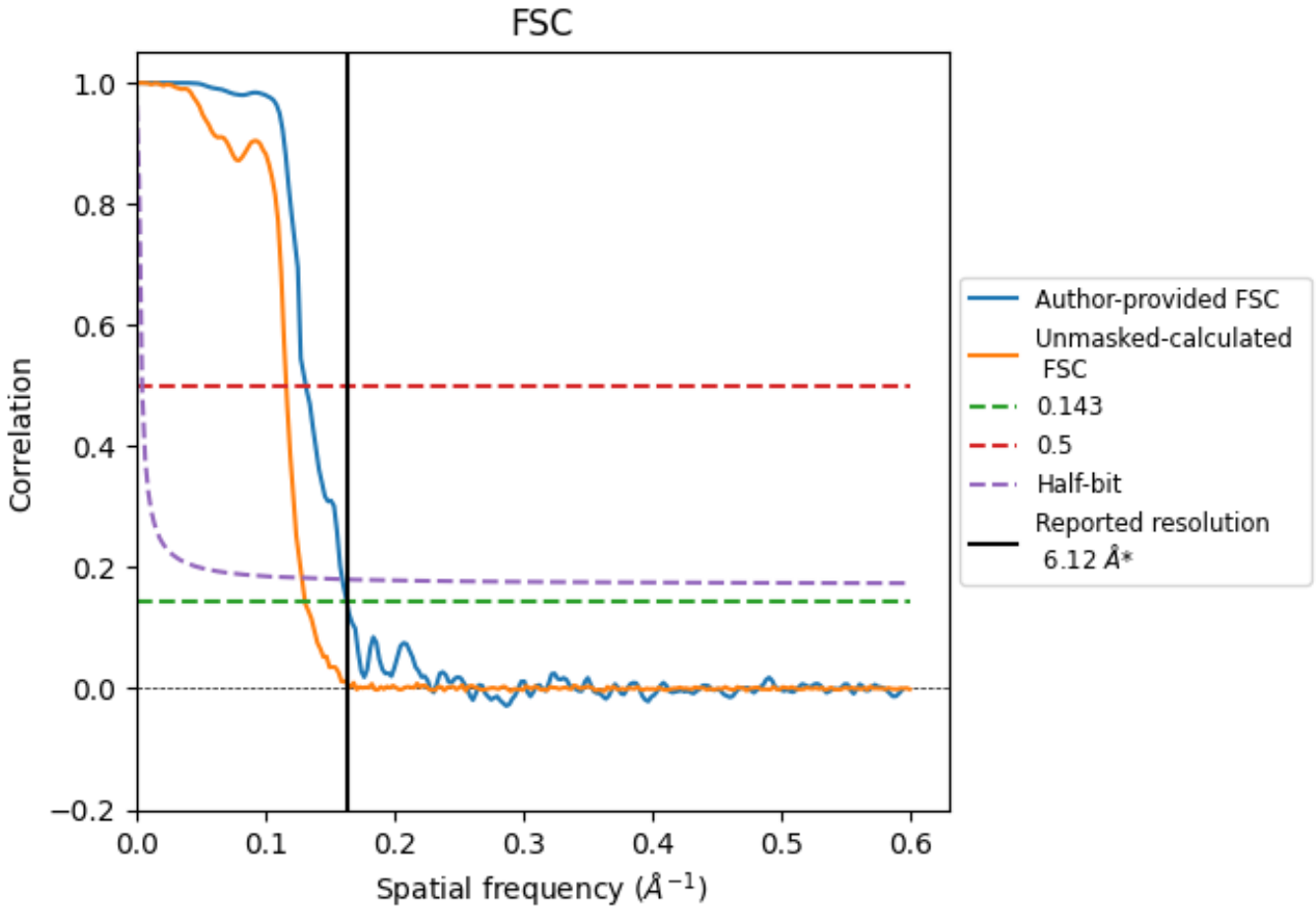


*Reported resolution corresponds to spatial frequency of 0.163 Å^{-1}

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 0.163 Å^{-1}

8.2 Resolution estimates (i)

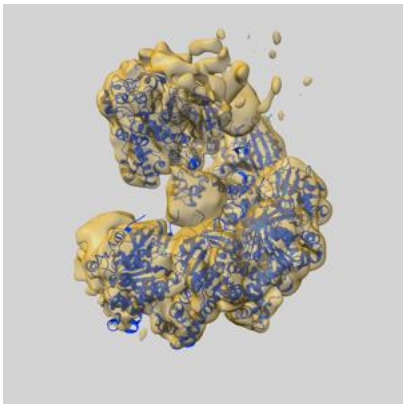
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	6.12	-	-
Author-provided FSC curve	6.12	7.60	6.25
Unmasked-calculated*	7.63	8.59	7.78

*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 7.63 differs from the reported value 6.12 by more than 10 %

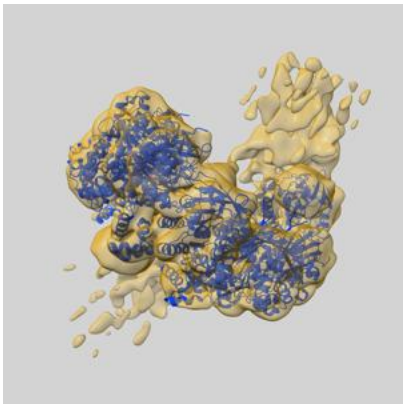
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-52848 and PDB model 9IG0. Per-residue inclusion information can be found in section 3 on page 6.

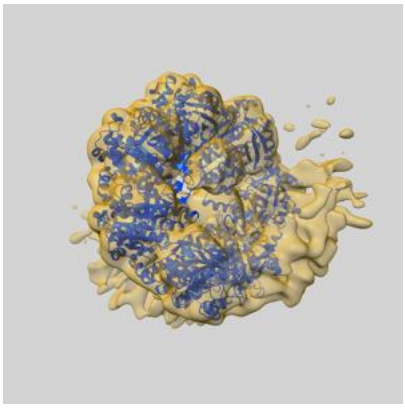
9.1 Map-model overlay



X



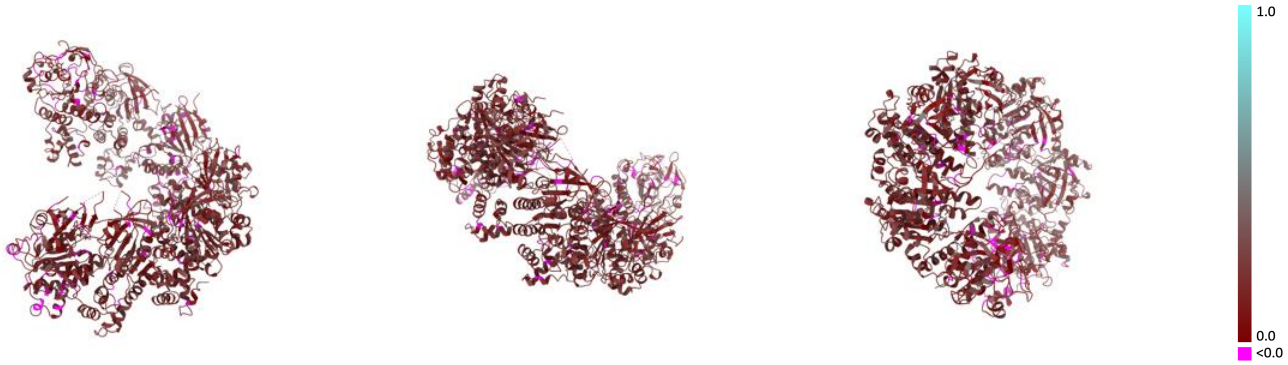
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.055 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.

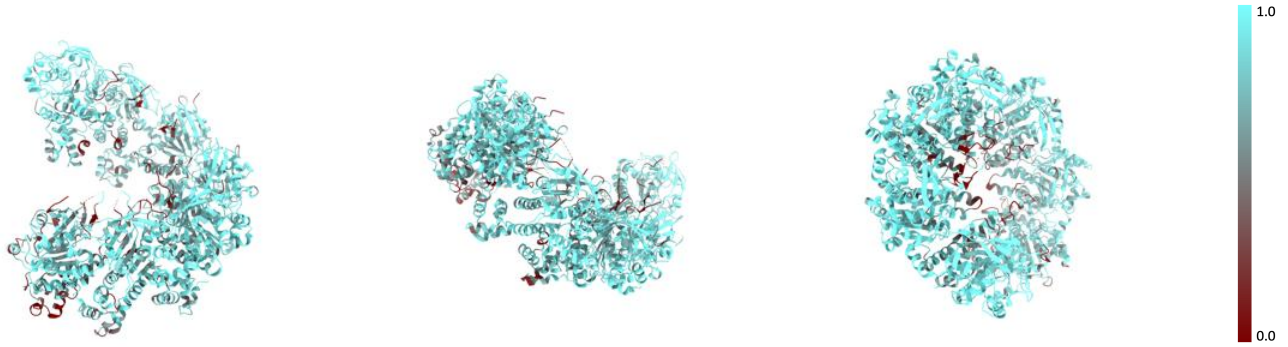
9.2 Q-score mapped to coordinate model (i)



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.

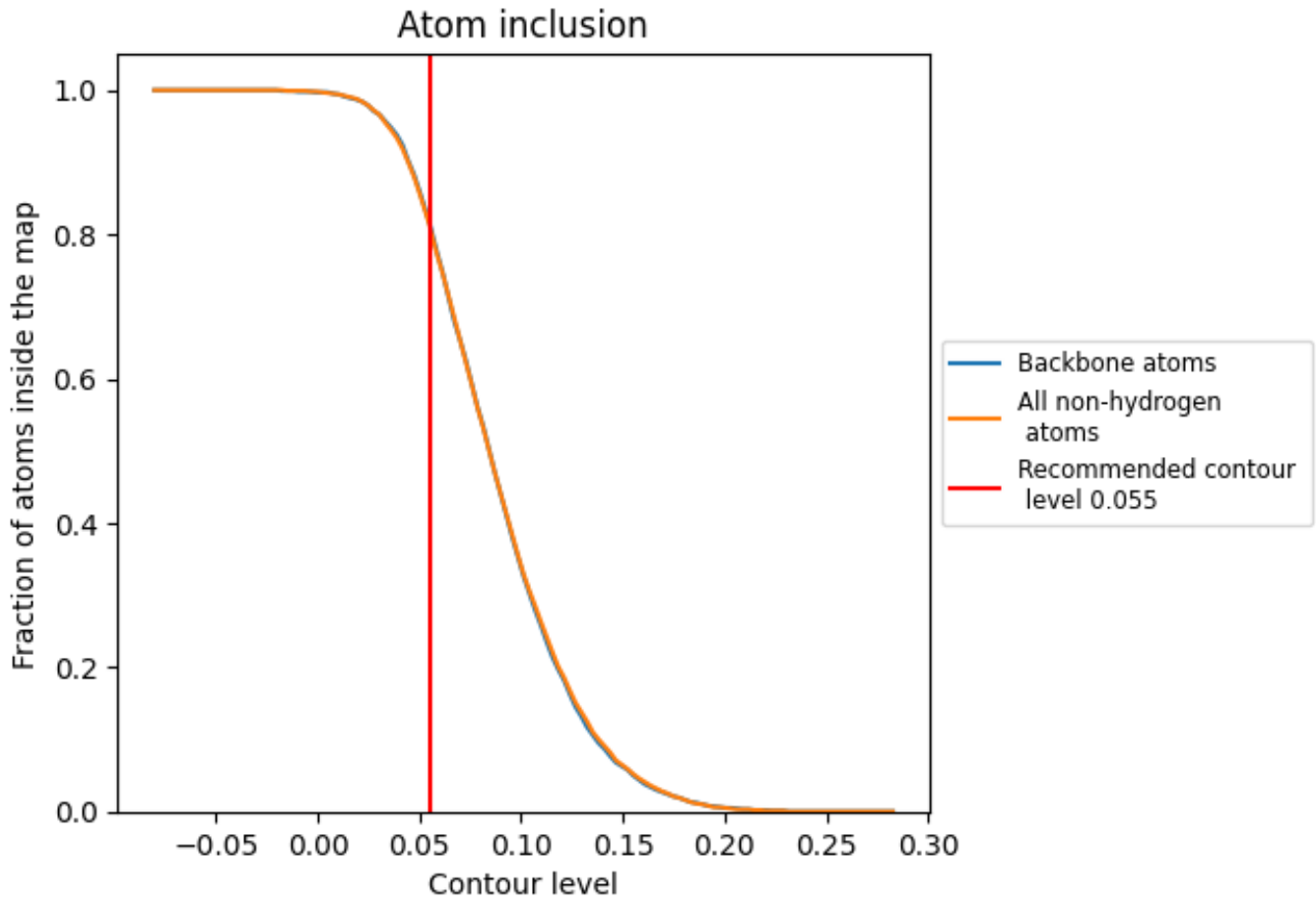
9.3 Atom inclusion mapped to coordinate model (i)



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 (0.055).

9.4 Atom inclusion (i)



At the recommended contour level, 82% of all backbone atoms, 81% 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 (0.055) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8130	0.1630
B	0.8620	0.1530
C	0.8650	0.1810
D	0.8050	0.1620
E	0.8620	0.1750
F	0.8200	0.1700
G	0.8080	0.1660
H	0.6670	0.1310

