



Full wwPDB EM Validation Report ⓘ

Apr 21, 2026 – 01:27 PM EDT

PDB ID : 8FS4 / pdb_00008fs4
EMDB ID : EMD-29413
Title : Structure of *S. cerevisiae* Rad24-RFC loading the 9-1-1 clamp onto a 10-nt gapped DNA in step 2 (open 9-1-1 ring and flexibly bound chamber DNA)
Authors : Zheng, F.; Georgescu, R.; Yao, Y.N.; O'Donnell, M.E.; Li, H.
Deposited on : 2023-01-09
Resolution : 2.94 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:

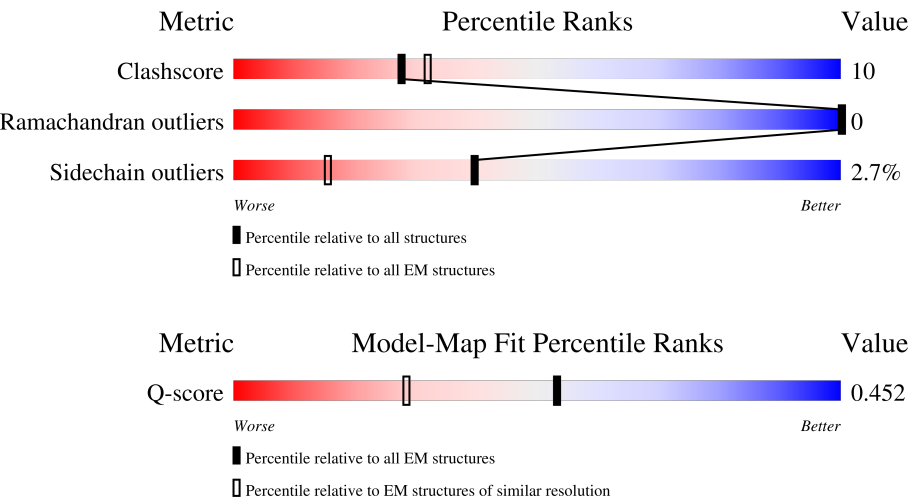
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

1 Overall quality at a glance i

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

The reported resolution of this entry is 2.94 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	13068 (2.44 - 3.44)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5%. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion < 40%). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	544	5% 59% 19% 22%
2	B	323	85% 12% ..
3	C	336	80% 17% ..
4	D	353	76% 17% 7%

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Mol	Chain	Length	Quality of chain
5	E	354	
6	F	474	
7	G	401	
8	H	612	
9	I	50	
10	J	21	
11	K	20	

2 Entry composition

There are 14 unique types of molecules in this entry. The entry contains 21291 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 Checkpoint protein RAD24.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	423	Total	C	N	O	S	0	0
			3466	2214	600	635	17		

- Molecule 2 is a protein called Replication factor C subunit 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	316	Total	C	N	O	S	0	0
			2482	1566	442	461	13		

- Molecule 3 is a protein called Replication factor C subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	328	Total	C	N	O	S	0	0
			2593	1633	452	500	8		

- Molecule 4 is a protein called Replication factor C subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	330	Total	C	N	O	S	0	0
			2616	1653	452	501	10		

- Molecule 5 is a protein called Replication factor C subunit 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	349	Total	C	N	O	S	0	0
			2760	1747	479	516	18		

- Molecule 6 is a protein called DNA damage checkpoint control protein MEC3.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	270	Total	C	N	O	S	0	0
			2184	1398	377	391	18		

- Molecule 7 is a protein called DNA damage checkpoint control protein RAD17.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	286	Total	C	N	O	S	0	0
			2265	1443	369	441	12		

- Molecule 8 is a protein called DDC1 isoform 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	H	237	Total	C	N	O	S	0	0
			1930	1248	315	355	12		

- Molecule 9 is a DNA chain called Template strand.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	I	24	Total	C	N	O	P	0	0
			488	234	81	149	24		

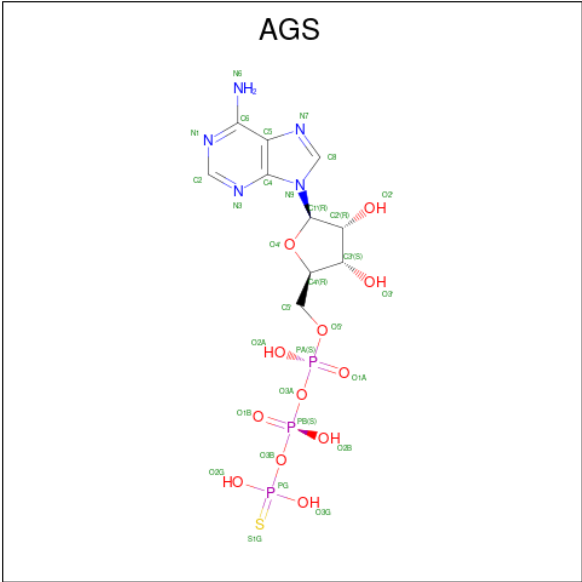
- Molecule 10 is a DNA chain called Primer strand 1.

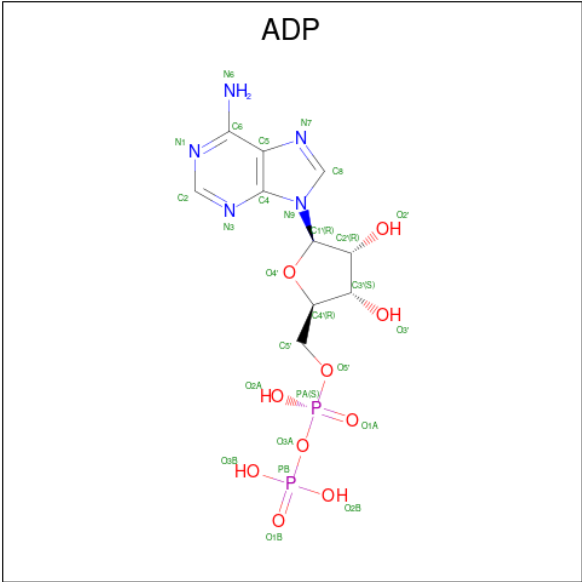
Mol	Chain	Residues	Atoms					AltConf	Trace
10	J	8	Total	C	N	O	P	0	0
			151	68	31	44	8		

- Molecule 11 is a DNA chain called Primer strand 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	K	10	Total	C	N	O	P	0	0
			201	98	34	60	9		

- Molecule 12 is PHOSPHOTHIOPHOSPHORIC ACID-ADENYLATE ESTER (CCD ID: AGS) (formula: C₁₀H₁₆N₅O₁₂P₃S).



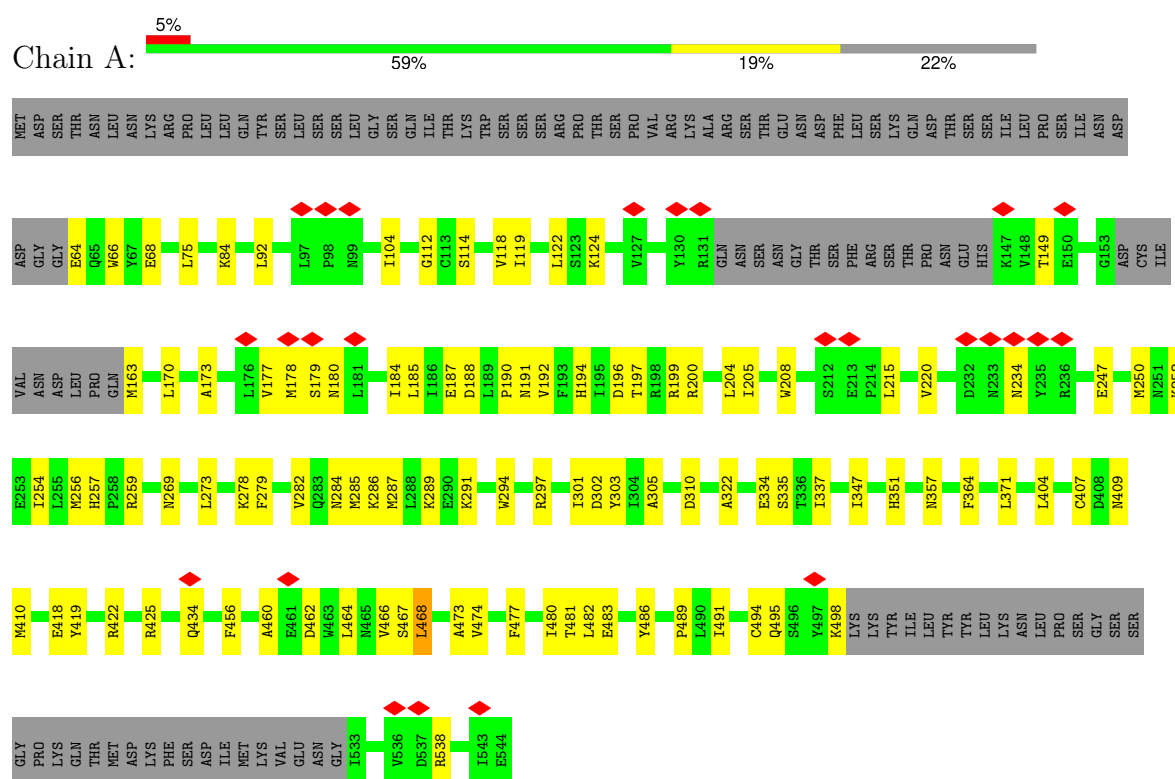


Mol	Chain	Residues	Atoms					AltConf
14	E	1	Total	C	N	O	P	0
			27	10	5	10	2	

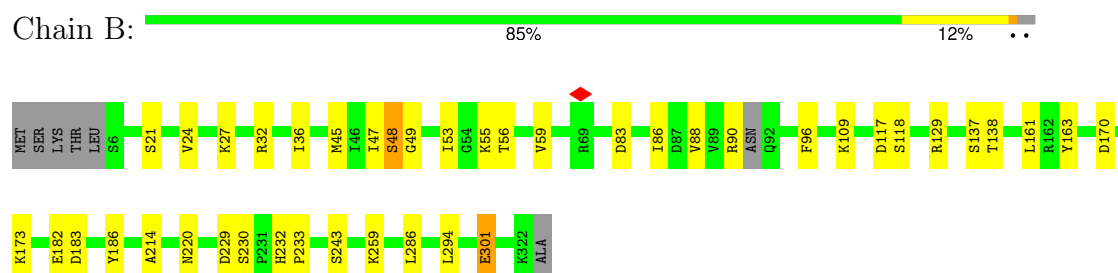
3 Residue-property plots

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: Checkpoint protein RAD24

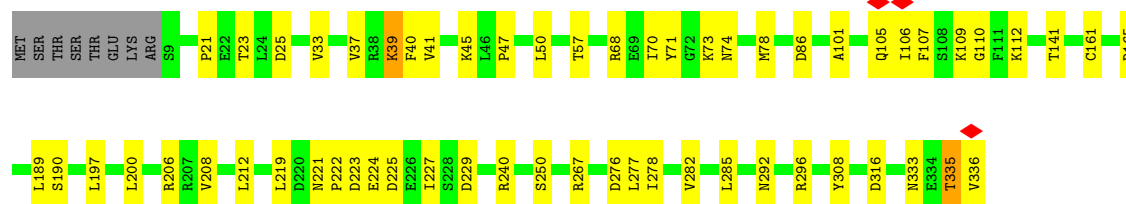


• Molecule 2: Replication factor C subunit 4



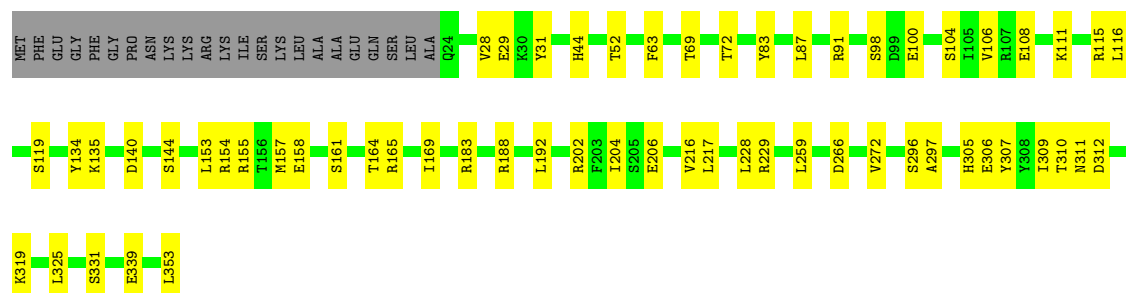
• Molecule 3: Replication factor C subunit 3

Chain C:  80% 17% ..



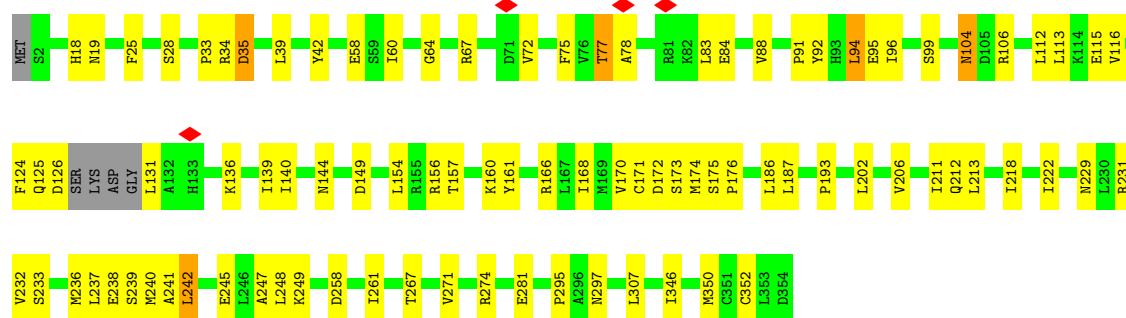
• Molecule 4: Replication factor C subunit 2

Chain D:  76% 17% 7%

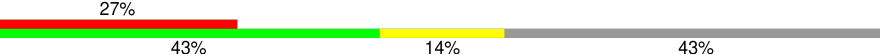


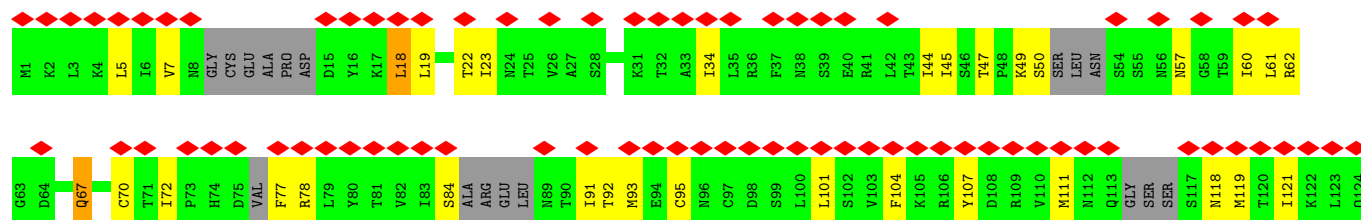
• Molecule 5: Replication factor C subunit 5

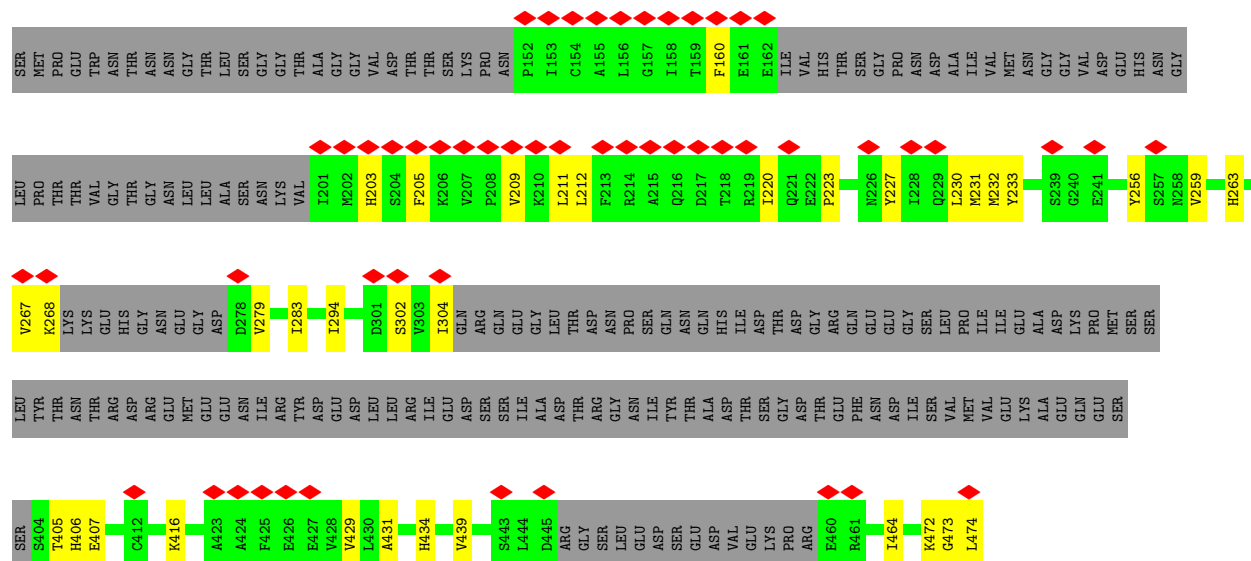
Chain E:  73% 25% ..



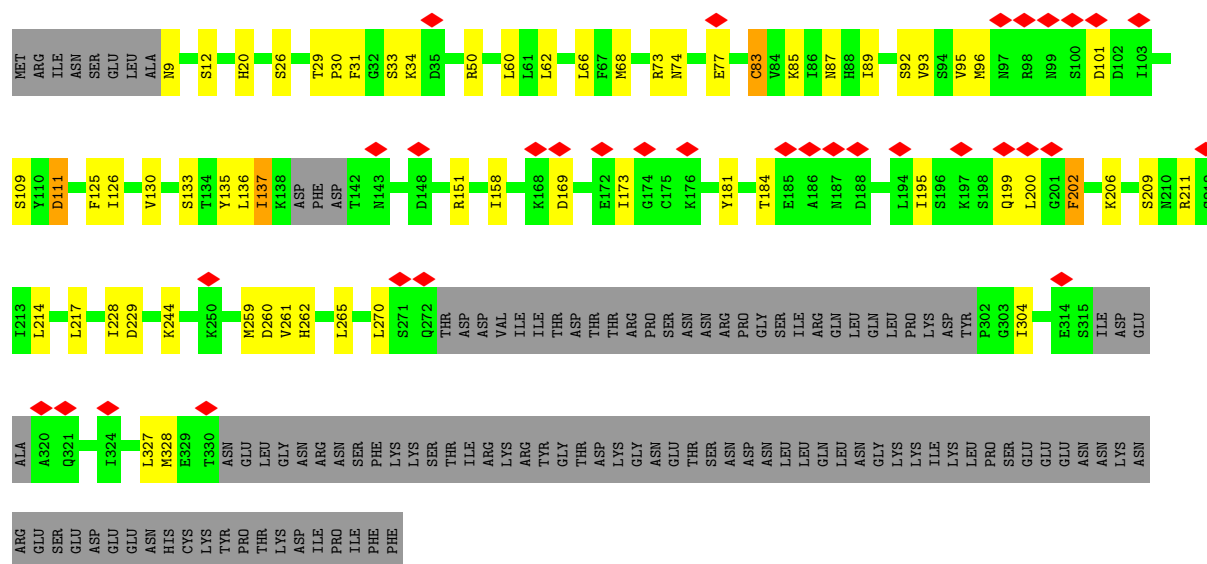
• Molecule 6: DNA damage checkpoint control protein MEC3

Chain F:  27% 43% 14% 43%

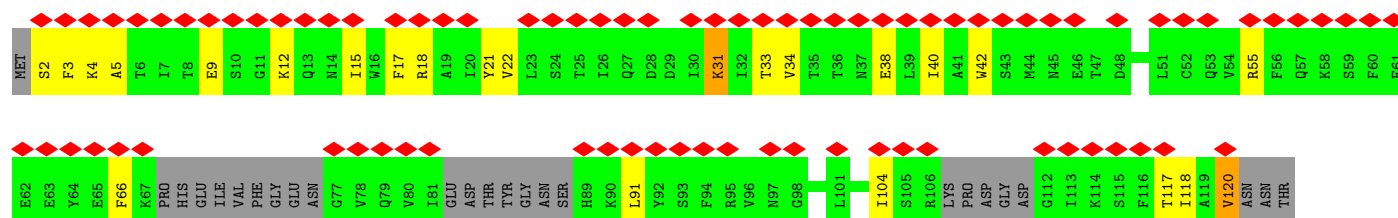


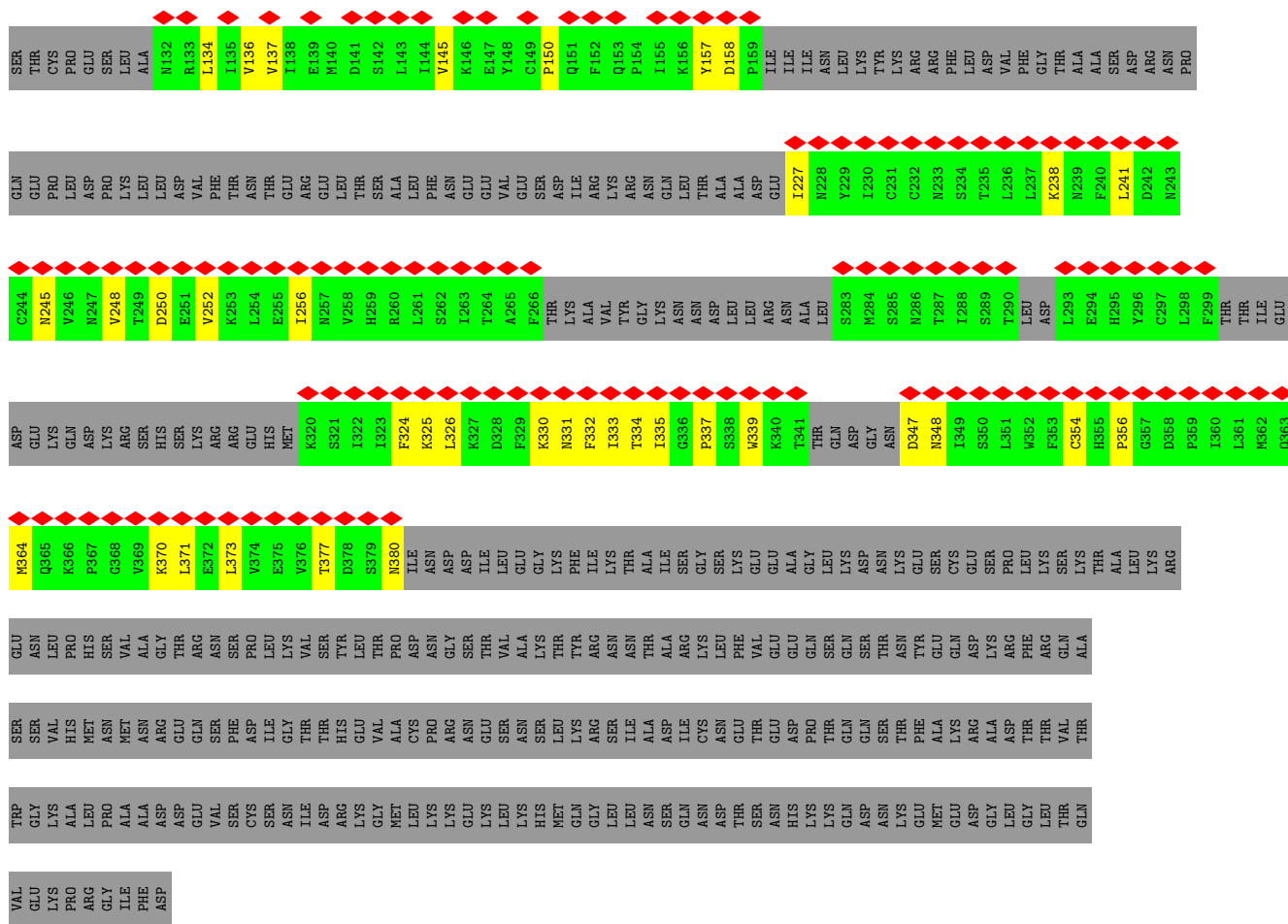


• Molecule 7: DNA damage checkpoint control protein RAD17

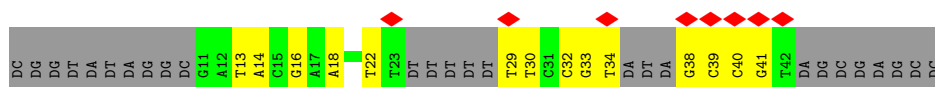


• Molecule 8: DDC1 isoform 1





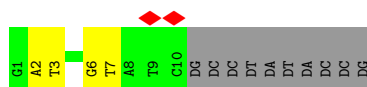
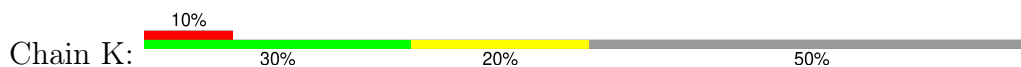
- Molecule 9: Template strand



- Molecule 10: Primer strand 1



- Molecule 11: Primer strand 2



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	347098	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	64	Depositor
Minimum defocus (nm)	1300	Depositor
Maximum defocus (nm)	1900	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	1.499	Depositor
Minimum map value	-0.987	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.028	Depositor
Recommended contour level	0.12	Depositor
Map size ($\text{\AA}$)	347.76, 347.76, 347.76	wwPDB
Map dimensions	420, 420, 420	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	0.828, 0.828, 0.828	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: ADP, AGS, MG

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	0.22	0/3539	0.41	0/4767
2	B	0.15	0/2516	0.30	0/3390
3	C	0.24	0/2633	0.39	0/3562
4	D	0.24	0/2661	0.36	0/3600
5	E	0.27	0/2799	0.41	0/3781
6	F	0.39	0/2218	0.49	0/2981
7	G	0.20	0/2298	0.35	0/3091
8	H	0.21	0/1963	0.32	0/2645
9	I	0.25	0/542	0.47	0/829
10	J	0.19	0/168	0.42	0/256
11	K	0.21	0/224	0.49	0/344
All	All	0.25	0/21561	0.39	0/29246

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3466	0	3480	85	0
2	B	2482	0	2576	26	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	2593	0	2623	47	0
4	D	2616	0	2647	35	0
5	E	2760	0	2875	84	0
6	F	2184	0	2225	59	0
7	G	2265	0	2271	40	0
8	H	1930	0	1940	53	0
9	I	488	0	276	12	0
10	J	151	0	78	4	0
11	K	201	0	116	2	0
12	A	31	0	12	2	0
12	B	31	0	12	1	0
12	C	31	0	12	3	0
12	D	31	0	12	0	0
13	A	1	0	0	0	0
13	B	1	0	0	0	0
13	C	1	0	0	0	0
13	D	1	0	0	0	0
14	E	27	0	12	0	0
All	All	21291	0	21167	413	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 10.

All (413) 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)
6:F:19:LEU:HD12	6:F:72:ILE:HG21	1.51	0.92
6:F:230:LEU:HD11	6:F:431:ALA:HB1	1.59	0.83
6:F:84:SER:HB2	6:F:91:ILE:HD11	1.62	0.82
8:H:22:VAL:HG21	8:H:335:ILE:CD1	2.11	0.80
6:F:91:ILE:HG22	6:F:93:MET:HE1	1.61	0.80
12:C:401:AGS:S1G	4:D:183:ARG:NH2	2.55	0.79
6:F:93:MET:HE2	6:F:93:MET:N	1.99	0.77
1:A:250:MET:HE3	1:A:254:ILE:HG21	1.67	0.76
1:A:178:MET:HE3	1:A:179:SER:N	2.04	0.72
1:A:302:ASP:OD1	1:A:303:TYR:N	2.23	0.72
8:H:22:VAL:CG2	8:H:335:ILE:HD11	2.21	0.70
1:A:75:LEU:HD11	1:A:122:LEU:HD21	1.73	0.69
4:D:202:ARG:O	4:D:206:GLU:HG3	1.93	0.68
3:C:105:GLN:O	3:C:106:ILE:HG12	1.93	0.68
3:C:105:GLN:HG3	3:C:110:GLY:O	1.94	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
8:H:34:VAL:HG12	8:H:66:PHE:CE2	2.28	0.68
2:B:56:THR:HA	2:B:59:VAL:HG12	1.75	0.68
5:E:96:ILE:HD11	5:E:140:ILE:HD13	1.77	0.67
3:C:71:TYR:HA	3:C:109:LYS:HG3	1.76	0.66
4:D:115:ARG:NH2	7:G:136:LEU:O	2.29	0.66
5:E:136:LYS:HZ1	6:F:60:ILE:HG23	1.60	0.66
6:F:7:VAL:HA	6:F:77:PHE:N	2.10	0.66
8:H:33:THR:HG23	8:H:42:TRP:HE1	1.60	0.65
1:A:149:THR:HG22	1:A:149:THR:O	1.97	0.64
1:A:178:MET:HE3	1:A:179:SER:CA	2.28	0.64
1:A:188:ASP:OD2	2:B:129:ARG:NH1	2.31	0.64
2:B:83:ASP:O	2:B:88:VAL:HG21	1.98	0.63
8:H:22:VAL:HG21	8:H:335:ILE:HD11	1.78	0.63
1:A:273:LEU:HD23	1:A:305:ALA:HA	1.81	0.63
2:B:53:ILE:HD12	2:B:163:TYR:HB3	1.80	0.63
3:C:68:ARG:HG3	3:C:68:ARG:HH11	1.64	0.63
3:C:335:THR:O	3:C:336:VAL:C	2.42	0.62
3:C:78:MET:HE1	3:C:105:GLN:HB2	1.81	0.62
6:F:92:THR:C	6:F:93:MET:HE2	2.25	0.62
1:A:170:LEU:HD12	1:A:204:LEU:HD22	1.82	0.62
6:F:406:HIS:HD2	6:F:434:HIS:HB2	1.65	0.61
6:F:7:VAL:HG22	6:F:121:ILE:HD11	1.83	0.60
8:H:31:LYS:HD2	8:H:42:TRP:CZ2	2.35	0.60
5:E:172:ASP:O	5:E:173:SER:HB2	2.01	0.60
8:H:18:ARG:HG3	8:H:335:ILE:HD12	1.82	0.60
8:H:104:ILE:HG21	8:H:136:VAL:HG11	1.83	0.60
3:C:40:PHE:CE1	3:C:47:PRO:HD3	2.37	0.60
8:H:120:VAL:HG13	8:H:134:LEU:HD12	1.83	0.60
8:H:3:PHE:CE2	8:H:34:VAL:HG13	2.37	0.60
1:A:434:GLN:HA	1:A:434:GLN:OE1	2.02	0.59
8:H:335:ILE:CG2	8:H:371:LEU:HD21	2.32	0.59
5:E:211:ILE:C	5:E:211:ILE:HD12	2.28	0.59
7:G:29:THR:N	7:G:30:PRO:HD2	2.18	0.59
7:G:181:TYR:CD1	7:G:328:MET:HE1	2.38	0.59
1:A:494:CYS:HB3	5:E:242:LEU:HD12	1.85	0.58
5:E:77:THR:HG23	5:E:78:ALA:N	2.18	0.58
8:H:22:VAL:HG22	8:H:331:ASN:HB3	1.84	0.58
5:E:136:LYS:O	5:E:166:ARG:N	2.34	0.58
6:F:91:ILE:HG22	6:F:93:MET:CE	2.31	0.58
1:A:285:MET:HG2	1:A:286:LYS:HD3	1.86	0.58
1:A:456:PHE:CE1	1:A:481:THR:HG22	2.39	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:214:ALA:O	3:C:39:LYS:HE3	2.04	0.58
5:E:94:LEU:HD11	6:F:61:LEU:HD11	1.86	0.58
5:E:174:MET:HE1	5:E:187:LEU:HD22	1.86	0.57
5:E:91:PRO:HA	6:F:60:ILE:HD11	1.84	0.57
1:A:286:LYS:HE2	1:A:286:LYS:H	1.70	0.57
3:C:78:MET:HE2	3:C:78:MET:HA	1.85	0.57
5:E:83:LEU:HD22	5:E:104:ASN:ND2	2.20	0.57
3:C:40:PHE:CD1	3:C:47:PRO:HD3	2.39	0.57
5:E:115:GLU:OE1	6:F:61:LEU:HD23	2.05	0.57
5:E:113:LEU:HD23	5:E:157:THR:HG21	1.87	0.57
5:E:240:MET:HG3	5:E:248:LEU:HD22	1.86	0.56
8:H:33:THR:HB	8:H:91:LEU:HD11	1.87	0.56
3:C:86:ASP:OD1	4:D:111:LYS:NZ	2.39	0.56
6:F:406:HIS:CD2	6:F:434:HIS:HB2	2.41	0.56
5:E:104:ASN:OD1	5:E:104:ASN:N	2.39	0.56
6:F:44:ILE:HB	6:F:70:CYS:SG	2.47	0.55
7:G:202:PHE:HD2	7:G:327:LEU:HD22	1.70	0.55
3:C:41:VAL:HG22	3:C:70:ILE:HD11	1.89	0.55
4:D:155:ARG:NH1	4:D:158:GLU:OE1	2.39	0.55
8:H:347:ASP:OD1	8:H:347:ASP:N	2.39	0.55
4:D:161:SER:O	4:D:165:ARG:NH1	2.39	0.55
5:E:271:VAL:O	5:E:274:ARG:NH1	2.39	0.55
6:F:84:SER:CB	6:F:91:ILE:HD11	2.34	0.55
1:A:456:PHE:HE1	1:A:481:THR:HG22	1.72	0.55
8:H:21:TYR:HD1	8:H:21:TYR:O	1.90	0.55
2:B:56:THR:HA	2:B:59:VAL:CG1	2.36	0.54
5:E:39:LEU:HD12	5:E:168:ILE:HD12	1.89	0.54
4:D:297:ALA:HB2	4:D:339:GLU:HB3	1.89	0.54
5:E:206:VAL:HG12	5:E:211:ILE:HG12	1.90	0.54
5:E:211:ILE:HD13	5:E:248:LEU:HD12	1.89	0.54
4:D:135:LYS:NZ	4:D:164:THR:OG1	2.40	0.54
6:F:107:TYR:CG	6:F:119:MET:HE3	2.43	0.54
1:A:247:GLU:CD	9:I:22:DT:H71	2.33	0.54
1:A:177:VAL:O	1:A:180:ASN:N	2.39	0.53
4:D:306:GLU:O	4:D:310:THR:HG23	2.08	0.53
5:E:18:HIS:ND1	5:E:19:ASN:OD1	2.40	0.53
5:E:346:ILE:O	5:E:350:MET:HG2	2.07	0.53
7:G:68:MET:SD	7:G:68:MET:N	2.80	0.53
5:E:35:ASP:OD1	5:E:35:ASP:N	2.36	0.53
8:H:17:PHE:CD1	8:H:17:PHE:C	2.84	0.53
1:A:104:ILE:CD1	1:A:205:ILE:HD11	2.39	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:285:MET:HG3	1:A:289:LYS:CE	2.38	0.53
5:E:211:ILE:HD12	5:E:212:GLN:N	2.22	0.53
6:F:49:LYS:O	6:F:50:SER:CB	2.56	0.53
8:H:3:PHE:HE2	8:H:34:VAL:HG13	1.73	0.53
9:I:29:DT:H2'	9:I:30:DT:H72	1.91	0.53
1:A:119:ILE:HD13	1:A:220:VAL:HG11	1.91	0.52
3:C:105:GLN:HA	3:C:112:LYS:HE2	1.92	0.52
5:E:58:GLU:OE2	5:E:58:GLU:C	2.52	0.52
1:A:178:MET:HE3	1:A:179:SER:HB3	1.90	0.52
5:E:34:ARG:HE	5:E:131:LEU:HD22	1.75	0.52
6:F:22:THR:HG22	6:F:464:ILE:HD11	1.91	0.52
6:F:431:ALA:HB3	6:F:439:VAL:HB	1.92	0.52
7:G:96:MET:HE1	7:G:130:VAL:HG21	1.90	0.52
7:G:125:PHE:HB2	7:G:126:ILE:HD12	1.92	0.52
1:A:297:ARG:O	1:A:301:ILE:HG13	2.10	0.52
12:A:601:AGS:O2G	12:A:601:AGS:O2B	2.27	0.52
8:H:335:ILE:HG22	8:H:371:LEU:HD21	1.92	0.52
5:E:211:ILE:HG22	5:E:241:ALA:HB1	1.91	0.52
5:E:18:HIS:ND1	5:E:193:PRO:HG3	2.25	0.51
6:F:45:ILE:HG22	6:F:47:THR:HG23	1.92	0.51
8:H:238:LYS:HD2	8:H:337:PRO:HG3	1.93	0.51
8:H:3:PHE:HE1	8:H:5:ALA:HB2	1.75	0.51
8:H:333:ILE:HA	8:H:364:MET:HE1	1.92	0.51
1:A:178:MET:HE3	1:A:179:SER:CB	2.41	0.51
6:F:472:LYS:HG2	6:F:473:GLY:H	1.76	0.51
1:A:409:ASN:C	1:A:409:ASN:OD1	2.53	0.51
1:A:482:LEU:HD11	5:E:295:PRO:HD2	1.93	0.51
4:D:44:HIS:NE2	4:D:188:ARG:O	2.34	0.51
7:G:31:PHE:CE1	7:G:244:LYS:HB3	2.45	0.51
5:E:113:LEU:HD22	5:E:154:LEU:HD21	1.92	0.50
5:E:168:ILE:HG23	5:E:168:ILE:O	2.11	0.50
1:A:114:SER:O	1:A:114:SER:OG	2.25	0.50
1:A:460:ALA:HB1	1:A:480:ILE:HG21	1.93	0.50
2:B:48:SER:OG	2:B:49:GLY:N	2.45	0.50
8:H:38:GLU:OE1	8:H:55:ARG:NE	2.45	0.50
8:H:33:THR:HG23	8:H:42:TRP:NE1	2.26	0.50
3:C:224:GLU:OE2	3:C:224:GLU:O	2.30	0.50
6:F:232:MET:HE1	6:F:304:ILE:HD12	1.93	0.50
8:H:42:TRP:CD1	8:H:42:TRP:N	2.80	0.50
5:E:160:LYS:HE2	5:E:161:TYR:CE2	2.46	0.50
3:C:78:MET:HE1	3:C:105:GLN:CB	2.41	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:221:ASN:O	3:C:225:ASP:HB2	2.12	0.50
5:E:281:GLU:OE2	5:E:281:GLU:HA	2.11	0.50
7:G:62:LEU:HD21	7:G:304:ILE:HD12	1.92	0.50
1:A:491:ILE:HD11	5:E:239:SER:HA	1.94	0.50
5:E:72:VAL:HG13	5:E:84:GLU:OE2	2.11	0.50
5:E:213:LEU:CD1	5:E:218:ILE:HD11	2.41	0.50
1:A:477:PHE:O	1:A:481:THR:HG23	2.12	0.49
3:C:276:ASP:OD1	3:C:277:LEU:N	2.45	0.49
1:A:464:LEU:O	1:A:464:LEU:HD23	2.11	0.49
4:D:63:PHE:HB2	4:D:169:ILE:HD13	1.94	0.49
5:E:96:ILE:HD11	5:E:140:ILE:CD1	2.41	0.49
5:E:124:PHE:CE2	6:F:67:GLN:NE2	2.81	0.49
5:E:213:LEU:HD11	5:E:218:ILE:HD11	1.94	0.49
6:F:78:ARG:HD2	6:F:118:ASN:ND2	2.27	0.49
1:A:92:LEU:HD12	1:A:122:LEU:HD13	1.93	0.49
1:A:104:ILE:HD11	1:A:205:ILE:HD11	1.94	0.49
1:A:483:GLU:OE1	5:E:231:ARG:NH1	2.40	0.49
6:F:263:HIS:NE2	6:F:407:GLU:OE2	2.45	0.49
7:G:87:ASN:N	7:G:87:ASN:OD1	2.45	0.49
5:E:83:LEU:HD22	5:E:104:ASN:HD21	1.76	0.49
5:E:297:ASN:OD1	5:E:297:ASN:N	2.42	0.49
7:G:206:LYS:HB3	8:H:145:VAL:HG13	1.93	0.49
6:F:91:ILE:CG2	6:F:93:MET:HE1	2.36	0.49
7:G:126:ILE:HD12	7:G:126:ILE:N	2.26	0.49
2:B:86:ILE:O	2:B:90:ARG:HG3	2.12	0.49
1:A:163:MET:HB3	9:I:34:DT:H5'	1.94	0.49
6:F:91:ILE:HG22	6:F:93:MET:SD	2.53	0.49
1:A:279:PHE:CD1	1:A:279:PHE:C	2.91	0.49
2:B:229:ASP:OD2	3:C:165:ARG:NH1	2.46	0.49
4:D:72:THR:HG21	5:E:156:ARG:NH1	2.27	0.49
7:G:111:ASP:OD1	7:G:111:ASP:N	2.45	0.49
8:H:22:VAL:HG21	8:H:335:ILE:HD13	1.94	0.49
7:G:60:LEU:HD23	7:G:304:ILE:HD13	1.95	0.49
1:A:302:ASP:OD1	1:A:302:ASP:C	2.56	0.49
5:E:112:LEU:HD21	6:F:61:LEU:HD21	1.95	0.49
5:E:258:ASP:O	5:E:261:ILE:HG13	2.13	0.49
6:F:283:ILE:O	6:F:294:ILE:N	2.46	0.49
8:H:21:TYR:CE2	10:J:13:DC:OP1	2.66	0.49
6:F:60:ILE:O	6:F:61:LEU:HB2	2.13	0.48
5:E:245:GLU:C	5:E:247:ALA:H	2.22	0.48
7:G:181:TYR:CG	7:G:328:MET:HE1	2.49	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
8:H:33:THR:HG21	8:H:157:TYR:CD1	2.48	0.48
1:A:287:MET:SD	1:A:291:LYS:HG3	2.53	0.48
4:D:216:VAL:O	4:D:217:LEU:HB2	2.13	0.48
4:D:153:LEU:O	4:D:157:MET:HG3	2.14	0.47
5:E:172:ASP:O	5:E:172:ASP:OD1	2.32	0.47
7:G:34:LYS:N	7:G:34:LYS:HD2	2.29	0.47
7:G:260:ASP:C	7:G:260:ASP:OD1	2.56	0.47
3:C:101:ALA:HA	3:C:141:THR:HG21	1.95	0.47
1:A:468:LEU:CD1	1:A:474:VAL:HG12	2.43	0.47
3:C:206:ARG:NH2	12:C:401:AGS:S1G	2.83	0.47
6:F:91:ILE:C	6:F:93:MET:HE1	2.40	0.47
1:A:194:HIS:NE2	9:I:32:DC:O2	2.47	0.47
3:C:68:ARG:HG3	3:C:68:ARG:NH1	2.28	0.47
6:F:232:MET:HB3	6:F:429:VAL:CG1	2.45	0.47
1:A:84:LYS:NZ	9:I:18:DA:OP1	2.36	0.47
2:B:301:GLU:OE1	3:C:308:TYR:OH	2.20	0.47
5:E:229:ASN:O	5:E:233:SER:OG	2.29	0.47
7:G:74:ASN:ND2	7:G:77:GLU:O	2.48	0.47
1:A:177:VAL:O	1:A:178:MET:C	2.58	0.47
2:B:259:LYS:O	3:C:165:ARG:NE	2.40	0.47
3:C:333:ASN:O	3:C:336:VAL:HB	2.14	0.47
5:E:39:LEU:HB2	5:E:168:ILE:HD12	1.96	0.47
5:E:144:ASN:ND2	5:E:172:ASP:O	2.47	0.47
4:D:309:ILE:O	4:D:319:LYS:NZ	2.48	0.47
6:F:160:PHE:CE2	6:F:205:PHE:HE2	2.33	0.47
6:F:227:TYR:CE1	6:F:230:LEU:HD23	2.49	0.47
1:A:75:LEU:HD21	1:A:118:VAL:HG23	1.97	0.47
5:E:112:LEU:CD2	6:F:61:LEU:HD21	2.45	0.47
1:A:334:GLU:OE1	1:A:335:SER:N	2.48	0.46
5:E:136:LYS:NZ	6:F:60:ILE:HG23	2.30	0.46
3:C:229:ASP:OD1	3:C:229:ASP:N	2.47	0.46
1:A:190:PRO:O	1:A:191:ASN:C	2.59	0.46
8:H:55:ARG:HB2	8:H:370:LYS:HB2	1.96	0.46
1:A:410:MET:HE2	2:B:294:LEU:CD2	2.45	0.46
4:D:104:SER:O	4:D:108:GLU:HG3	2.16	0.46
4:D:312:ASP:OD1	4:D:312:ASP:N	2.48	0.46
5:E:125:GLN:O	5:E:126:ASP:C	2.58	0.46
4:D:91:ARG:NH1	4:D:119:SER:O	2.48	0.46
6:F:78:ARG:HD2	6:F:118:ASN:HD22	1.81	0.46
1:A:190:PRO:O	1:A:192:VAL:HG13	2.15	0.46
4:D:259:LEU:HD11	5:E:25:PHE:CE1	2.51	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
8:H:330:LYS:O	8:H:333:ILE:HG13	2.15	0.46
1:A:191:ASN:O	1:A:197:THR:HG23	2.16	0.46
1:A:196:ASP:OD1	1:A:199:ARG:NH2	2.48	0.46
3:C:197:LEU:HD21	3:C:208:VAL:HG13	1.98	0.46
4:D:192:LEU:HD12	4:D:228:LEU:HB2	1.97	0.46
3:C:71:TYR:O	3:C:109:LYS:HE3	2.16	0.46
3:C:197:LEU:HD11	3:C:212:LEU:HG	1.98	0.46
4:D:28:VAL:HG11	4:D:229:ARG:HG3	1.98	0.46
9:I:40:DC:H2''	9:I:41:DG:C8	2.51	0.46
2:B:53:ILE:HD12	2:B:163:TYR:CB	2.44	0.45
7:G:96:MET:HE1	7:G:130:VAL:CG2	2.45	0.45
8:H:348:ASN:OD1	8:H:348:ASN:N	2.50	0.45
1:A:185:LEU:HD23	1:A:187:GLU:H	1.80	0.45
1:A:418:GLU:OE1	1:A:422:ARG:NH1	2.50	0.45
1:A:462:ASP:O	1:A:466:VAL:HG23	2.14	0.45
2:B:47:ILE:HD12	2:B:47:ILE:N	2.31	0.45
5:E:18:HIS:CE1	5:E:19:ASN:OD1	2.69	0.45
7:G:209:SER:O	7:G:211:ARG:NH1	2.49	0.45
2:B:117:ASP:OD1	2:B:117:ASP:N	2.38	0.45
11:K:2:DA:H2'	11:K:3:DT:H72	1.98	0.45
3:C:25:ASP:OD1	3:C:25:ASP:C	2.58	0.45
5:E:83:LEU:HD13	5:E:104:ASN:HD22	1.81	0.45
8:H:134:LEU:N	8:H:150:PRO:O	2.49	0.45
10:J:19:DG:H2''	10:J:20:DG:H5''	1.98	0.45
1:A:252:LYS:O	1:A:256:MET:HG2	2.16	0.45
7:G:20:HIS:ND1	7:G:66:LEU:HD21	2.32	0.45
8:H:332:PHE:O	8:H:364:MET:HE1	2.15	0.45
3:C:219:LEU:HD11	3:C:227:ILE:HG13	1.99	0.45
11:K:6:DG:H2''	11:K:7:DT:H5''	1.98	0.45
4:D:272:VAL:HG21	4:D:307:TYR:HE2	1.82	0.45
5:E:113:LEU:HD22	5:E:154:LEU:CD2	2.47	0.45
7:G:85:LYS:HG2	7:G:135:TYR:CE2	2.52	0.45
2:B:32:ARG:O	2:B:36:ILE:HG13	2.17	0.45
3:C:50:LEU:HB2	3:C:161:CYS:HB3	1.99	0.45
1:A:337:ILE:HD12	1:A:337:ILE:O	2.17	0.44
2:B:232:HIS:N	2:B:233:PRO:CD	2.79	0.44
7:G:214:LEU:HD21	7:G:217:LEU:HD12	1.99	0.44
1:A:75:LEU:HD11	1:A:122:LEU:CD2	2.46	0.44
1:A:347:ILE:O	1:A:425:ARG:NH2	2.42	0.44
4:D:307:TYR:CD1	4:D:307:TYR:C	2.94	0.44
4:D:325:LEU:HD12	4:D:353:LEU:HD11	1.99	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:170:LEU:HA	1:A:173:ALA:HB3	1.99	0.44
1:A:187:GLU:OE2	1:A:187:GLU:O	2.35	0.44
1:A:294:TRP:CE3	1:A:297:ARG:HD3	2.52	0.44
3:C:292:ASN:ND2	3:C:333:ASN:O	2.50	0.44
5:E:33:PRO:HB3	5:E:60:ILE:HG23	1.99	0.44
5:E:222:ILE:HG12	5:E:240:MET:HE1	2.00	0.44
5:E:88:VAL:HG23	5:E:95:GLU:HB2	1.99	0.44
1:A:194:HIS:HB3	1:A:197:THR:HG22	1.99	0.44
1:A:278:LYS:HG3	1:A:301:ILE:HG21	2.00	0.44
5:E:139:ILE:HA	5:E:168:ILE:O	2.17	0.44
1:A:357:ASN:OD1	1:A:422:ARG:NH2	2.46	0.44
8:H:335:ILE:HG21	8:H:371:LEU:HD21	1.99	0.44
1:A:468:LEU:HD11	1:A:474:VAL:HG12	2.00	0.44
3:C:197:LEU:CD2	3:C:208:VAL:HG22	2.48	0.44
3:C:197:LEU:HD23	3:C:208:VAL:HG22	2.00	0.44
5:E:25:PHE:HZ	5:E:186:LEU:HD21	1.83	0.44
12:A:601:AGS:O2A	12:A:601:AGS:O1B	2.36	0.44
4:D:100:GLU:N	4:D:100:GLU:OE1	2.48	0.44
6:F:5:LEU:N	6:F:5:LEU:HD23	2.33	0.44
6:F:18:LEU:O	6:F:22:THR:HG23	2.18	0.44
8:H:34:VAL:HG12	8:H:66:PHE:CZ	2.51	0.44
1:A:285:MET:HB2	1:A:294:TRP:CE3	2.53	0.43
1:A:287:MET:HE1	1:A:322:ALA:HB1	2.00	0.43
3:C:221:ASN:O	3:C:223:ASP:N	2.50	0.43
6:F:45:ILE:CG2	6:F:47:THR:HG23	2.48	0.43
6:F:160:PHE:O	6:F:203:HIS:HD2	1.99	0.43
8:H:227:ILE:HG22	8:H:354:CYS:HB2	2.00	0.43
5:E:116:VAL:CG1	6:F:61:LEU:CD2	2.96	0.43
5:E:131:LEU:N	5:E:131:LEU:HD23	2.33	0.43
5:E:232:VAL:O	5:E:236:MET:HG3	2.18	0.43
3:C:221:ASN:O	3:C:222:PRO:C	2.61	0.43
5:E:124:PHE:HE2	6:F:223:PRO:CG	2.31	0.43
6:F:268:LYS:HA	6:F:279:VAL:HG12	1.99	0.43
8:H:331:ASN:HA	8:H:334:THR:HG22	2.00	0.43
5:E:92:TYR:CD1	5:E:92:TYR:N	2.86	0.43
5:E:241:ALA:HA	5:E:248:LEU:HD21	2.00	0.43
7:G:184:THR:O	7:G:184:THR:CG2	2.65	0.43
7:G:259:MET:HE2	7:G:265:LEU:HD13	2.00	0.43
6:F:279:VAL:HG21	6:F:302:SER:HB2	2.01	0.43
8:H:356:PRO:O	8:H:377:THR:OG1	2.32	0.43
5:E:175:SER:N	5:E:176:PRO:CD	2.82	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:E:95:GLU:HG2	5:E:139:ILE:HD12	2.00	0.43
7:G:31:PHE:O	7:G:50:ARG:CZ	2.66	0.43
1:A:489:PRO:HG3	1:A:538:ARG:HA	2.00	0.43
2:B:24:VAL:HG22	12:B:401:AGS:N1	2.34	0.43
4:D:31:TYR:CD2	4:D:204:ILE:HG12	2.53	0.43
7:G:151:ARG:HG2	7:G:261:VAL:HG22	2.01	0.43
1:A:64:GLU:OE2	1:A:68:GLU:OE1	2.37	0.43
3:C:278:ILE:O	3:C:282:VAL:HG23	2.19	0.43
5:E:202:LEU:O	5:E:206:VAL:HG13	2.19	0.43
6:F:256:TYR:HB2	6:F:259:VAL:HG23	2.01	0.43
3:C:229:ASP:OD2	3:C:240:ARG:NH2	2.52	0.42
6:F:57:ASN:HA	6:F:60:ILE:HD12	2.00	0.42
7:G:33:SER:OG	7:G:34:LYS:HE3	2.19	0.42
8:H:118:ILE:HD11	8:H:134:LEU:HD21	2.01	0.42
1:A:364:PHE:CE1	1:A:371:LEU:HD23	2.53	0.42
2:B:96:PHE:O	2:B:109:LYS:NZ	2.52	0.42
8:H:332:PHE:CE2	8:H:373:LEU:HB2	2.54	0.42
1:A:486:TYR:CE1	5:E:258:ASP:HB2	2.53	0.42
2:B:27:LYS:NZ	2:B:170:ASP:OD1	2.51	0.42
5:E:106:ARG:HD3	5:E:149:ASP:HB3	2.01	0.42
5:E:124:PHE:HE2	6:F:223:PRO:HG2	1.84	0.42
8:H:3:PHE:HD1	8:H:4:LYS:N	2.17	0.42
1:A:170:LEU:HD12	1:A:204:LEU:CD2	2.47	0.42
2:B:45:MET:HE2	2:B:161:LEU:HD13	2.01	0.42
4:D:28:VAL:HG23	4:D:29:GLU:HG3	2.01	0.42
5:E:202:LEU:HD22	5:E:237:LEU:HD22	2.01	0.42
7:G:228:ILE:CG1	7:G:229:ASP:N	2.83	0.42
8:H:117:THR:HB	8:H:137:VAL:HB	2.02	0.42
1:A:112:GLY:HA3	1:A:310:ASP:OD1	2.19	0.42
3:C:37:VAL:O	3:C:41:VAL:HG23	2.20	0.42
5:E:113:LEU:HA	5:E:116:VAL:HG22	2.01	0.42
5:E:160:LYS:HE2	5:E:161:TYR:CZ	2.55	0.42
5:E:267:THR:HG23	5:E:307:LEU:HG	2.01	0.42
8:H:380:ASN:OD1	8:H:380:ASN:N	2.52	0.42
1:A:257:HIS:CE1	1:A:259:ARG:HG3	2.54	0.42
3:C:73:LYS:HD3	3:C:74:ASN:N	2.34	0.42
7:G:92:SER:O	7:G:96:MET:HG3	2.20	0.42
7:G:199:GLN:HG3	7:G:200:LEU:HD12	2.02	0.42
9:I:33:DG:C2	10:J:19:DG:N1	2.88	0.42
1:A:149:THR:O	1:A:149:THR:CG2	2.66	0.42
1:A:464:LEU:HD23	1:A:464:LEU:C	2.44	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:F:231:MET:HE2	6:F:233:TYR:CE2	2.54	0.42
6:F:267:VAL:HG23	6:F:405:THR:HG22	2.01	0.42
6:F:473:GLY:O	6:F:474:LEU:C	2.63	0.42
2:B:182:GLU:O	2:B:183:ASP:OD1	2.37	0.42
2:B:220:ASN:OD1	2:B:220:ASN:N	2.52	0.42
3:C:200:LEU:C	3:C:200:LEU:HD12	2.45	0.42
4:D:116:LEU:HD21	7:G:133:SER:HB3	2.02	0.42
1:A:467:SER:HB3	1:A:473:ALA:HB3	2.02	0.42
1:A:495:GLN:O	1:A:498:LYS:HG3	2.19	0.42
4:D:154:ARG:HE	4:D:183:ARG:HH21	1.68	0.42
7:G:83:CYS:SG	7:G:137:ILE:HG22	2.60	0.42
7:G:101:ASP:OD1	7:G:101:ASP:N	2.53	0.42
7:G:260:ASP:OD1	7:G:262:HIS:N	2.50	0.42
8:H:245:ASN:HB3	8:H:248:VAL:HG22	2.01	0.42
3:C:107:PHE:O	3:C:107:PHE:CG	2.73	0.42
3:C:40:PHE:HD1	3:C:45:LYS:O	2.01	0.41
4:D:106:VAL:HG13	4:D:153:LEU:HD12	2.01	0.41
7:G:184:THR:O	7:G:184:THR:HG23	2.20	0.41
1:A:269:ASN:HB2	9:I:16:DG:OP1	2.19	0.41
2:B:186:TYR:CD1	2:B:186:TYR:C	2.97	0.41
5:E:238:GLU:O	5:E:242:LEU:HB2	2.21	0.41
6:F:62:ARG:HG2	6:F:62:ARG:HH11	1.84	0.41
1:A:66:TRP:CZ2	1:A:284:ASN:ND2	2.88	0.41
1:A:124:LYS:HZ3	1:A:124:LYS:HB3	1.85	0.41
2:B:55:LYS:O	2:B:59:VAL:HG12	2.20	0.41
6:F:34:ILE:HD13	6:F:220:ILE:HD13	2.03	0.41
4:D:140:ASP:HA	4:D:169:ILE:HB	2.02	0.41
5:E:211:ILE:C	5:E:211:ILE:CD1	2.93	0.41
6:F:111:MET:SD	6:F:111:MET:C	3.03	0.41
6:F:211:LEU:O	6:F:212:LEU:C	2.64	0.41
7:G:9:ASN:O	7:G:73:ARG:HD2	2.19	0.41
8:H:324:PHE:CD1	8:H:325:LYS:O	2.74	0.41
10:J:11:DG:H2"	10:J:12:DG:C8	2.56	0.41
5:E:96:ILE:HD12	5:E:96:ILE:O	2.20	0.41
8:H:252:VAL:HB	8:H:326:LEU:HD13	2.02	0.41
1:A:205:ILE:HD12	1:A:208:TRP:HB3	2.01	0.41
5:E:245:GLU:C	5:E:247:ALA:N	2.79	0.41
6:F:95:CYS:HB3	6:F:209:VAL:HG23	2.02	0.41
7:G:173:ILE:HG22	7:G:173:ILE:O	2.20	0.41
8:H:9:GLU:HB2	8:H:12:LYS:HG3	2.03	0.41
1:A:124:LYS:NZ	1:A:124:LYS:CB	2.83	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:285:MET:HG3	1:A:289:LYS:HE2	2.01	0.41
4:D:87:LEU:HG	4:D:91:ARG:HG3	2.03	0.41
4:D:272:VAL:HG11	4:D:307:TYR:CE2	2.56	0.41
7:G:89:ILE:O	7:G:93:VAL:HG23	2.21	0.41
8:H:34:VAL:O	8:H:91:LEU:HD12	2.21	0.41
9:I:13:DT:H2''	9:I:14:DA:C8	2.56	0.41
1:A:163:MET:HG2	1:A:200:ARG:HD3	2.03	0.41
3:C:21:PRO:HD3	12:C:401:AGS:H2'	2.02	0.41
3:C:285:LEU:O	3:C:296:ARG:NH1	2.50	0.40
4:D:305:HIS:O	4:D:309:ILE:HG12	2.21	0.40
5:E:75:PHE:N	5:E:75:PHE:CD1	2.88	0.40
9:I:40:DC:H2''	9:I:41:DG:N7	2.36	0.40
1:A:419:TYR:CE1	2:B:286:LEU:HD12	2.56	0.40
8:H:241:LEU:HD12	8:H:333:ILE:HG12	2.04	0.40
9:I:38:DG:H2''	9:I:39:DC:C6	2.56	0.40
1:A:124:LYS:HB3	1:A:124:LYS:NZ	2.35	0.40
1:A:278:LYS:O	1:A:282:VAL:HG13	2.21	0.40
5:E:64:GLY:HA2	5:E:67:ARG:HE	1.86	0.40
9:I:39:DC:H2''	9:I:40:DC:C5	2.56	0.40
3:C:189:LEU:HD12	3:C:227:ILE:HB	2.03	0.40
4:D:83:TYR:OH	4:D:134:TYR:O	2.24	0.40
6:F:23:ILE:HG12	6:F:104:PHE:CE2	2.56	0.40
8:H:15:ILE:HB	8:H:339:TRP:HB2	2.03	0.40
8:H:34:VAL:CG1	8:H:66:PHE:CE2	3.02	0.40
3:C:267:ARG:NH1	3:C:316:ASP:OD2	2.53	0.40
5:E:42:TYR:HA	5:E:171:CYS:O	2.22	0.40
7:G:9:ASN:ND2	7:G:109:SER:HB3	2.37	0.40
8:H:40:ILE:HG12	8:H:55:ARG:HG2	2.03	0.40
8:H:134:LEU:HB3	8:H:150:PRO:HG2	2.04	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	415/544 (76%)	395 (95%)	20 (5%)	0	100	100
2	B	312/323 (97%)	304 (97%)	8 (3%)	0	100	100
3	C	326/336 (97%)	317 (97%)	9 (3%)	0	100	100
4	D	328/353 (93%)	324 (99%)	4 (1%)	0	100	100
5	E	345/354 (98%)	330 (96%)	15 (4%)	0	100	100
6	F	248/474 (52%)	235 (95%)	13 (5%)	0	100	100
7	G	278/401 (69%)	264 (95%)	14 (5%)	0	100	100
8	H	217/612 (36%)	212 (98%)	5 (2%)	0	100	100
All	All	2469/3397 (73%)	2381 (96%)	88 (4%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	391/504 (78%)	384 (98%)	7 (2%)	51	72
2	B	277/283 (98%)	268 (97%)	9 (3%)	34	59
3	C	285/293 (97%)	278 (98%)	7 (2%)	42	66
4	D	294/312 (94%)	286 (97%)	8 (3%)	39	64
5	E	320/324 (99%)	310 (97%)	10 (3%)	35	60
6	F	250/424 (59%)	246 (98%)	4 (2%)	55	74
7	G	261/369 (71%)	250 (96%)	11 (4%)	26	52
8	H	225/560 (40%)	219 (97%)	6 (3%)	39	64
All	All	2303/3069 (75%)	2241 (97%)	62 (3%)	40	64

All (62) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	184	ILE
1	A	215	LEU

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Mol	Chain	Res	Type
1	A	234	ASN
1	A	351	HIS
1	A	404	LEU
1	A	407	CYS
1	A	468	LEU
2	B	21	SER
2	B	48	SER
2	B	118	SER
2	B	137	SER
2	B	138	THR
2	B	173	LYS
2	B	230	SER
2	B	243	SER
2	B	301	GLU
3	C	23	THR
3	C	33	VAL
3	C	39	LYS
3	C	57	THR
3	C	190	SER
3	C	250	SER
3	C	335	THR
4	D	52	THR
4	D	69	THR
4	D	98	SER
4	D	144	SER
4	D	266	ASP
4	D	296	SER
4	D	311	ASN
4	D	331	SER
5	E	28	SER
5	E	35	ASP
5	E	77	THR
5	E	94	LEU
5	E	99	SER
5	E	104	ASN
5	E	170	VAL
5	E	242	LEU
5	E	249	LYS
5	E	352	CYS
6	F	18	LEU
6	F	67	GLN
6	F	101	LEU

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Mol	Chain	Res	Type
6	F	416	LYS
7	G	12	SER
7	G	26	SER
7	G	83	CYS
7	G	95	VAL
7	G	111	ASP
7	G	137	ILE
7	G	158	ILE
7	G	169	ASP
7	G	195	ILE
7	G	202	PHE
7	G	270	LEU
8	H	2	SER
8	H	31	LYS
8	H	120	VAL
8	H	158	ASP
8	H	250	ASP
8	H	256	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (22) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	73	ASN
1	A	99	ASN
1	A	231	ASN
1	A	234	ASN
1	A	348	HIS
1	A	436	HIS
2	B	95	HIS
2	B	204	GLN
3	C	140	ASN
3	C	213	GLN
3	C	298	HIS
4	D	255	GLN
4	D	313	ASN
5	E	14	ASN
5	E	243	ASN
5	E	264	HIS
6	F	8	ASN
6	F	67	GLN
6	F	291	HIS
7	G	54	HIS

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Mol	Chain	Res	Type
7	G	262	HIS
8	H	247	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 9 ligands modelled in this entry, 4 are monoatomic - leaving 5 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
12	AGS	D	401	13	32,33,33	0.59	1 (3%)	45,52,52	0.74	1 (2%)
12	AGS	A	601	13	32,33,33	0.50	1 (3%)	45,52,52	0.70	1 (2%)
12	AGS	C	401	13	32,33,33	0.55	0	45,52,52	0.74	1 (2%)
12	AGS	B	401	13	32,33,33	0.53	0	45,52,52	0.66	1 (2%)
14	ADP	E	500	-	28,29,29	1.33	5 (17%)	43,45,45	1.95	12 (27%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
12	AGS	D	401	13	-	4/21/38/38	0/3/3/3
12	AGS	A	601	13	-	4/21/38/38	0/3/3/3
12	AGS	C	401	13	-	1/21/38/38	0/3/3/3
12	AGS	B	401	13	-	1/21/38/38	0/3/3/3
14	ADP	E	500	-	-	4/16/32/32	0/3/3/3

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
14	E	500	ADP	C5-C4	4.12	1.46	1.39
14	E	500	ADP	C5-N7	-2.45	1.34	1.39
14	E	500	ADP	C5-C6	2.22	1.47	1.41
14	E	500	ADP	C8-N7	2.22	1.36	1.31
14	E	500	ADP	C4-N9	-2.18	1.33	1.37
12	A	601	AGS	PG-S1G	2.10	1.95	1.90
12	D	401	AGS	PG-S1G	2.08	1.95	1.90

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
14	E	500	ADP	C5-C4-N3	-5.37	119.32	126.72
14	E	500	ADP	N3-C4-N9	4.74	135.23	127.17
12	C	401	AGS	PB-O3B-PG	-4.13	118.06	133.17
14	E	500	ADP	N3-C2-N1	-4.11	122.37	128.58
12	D	401	AGS	PB-O3B-PG	-3.93	118.79	133.17
14	E	500	ADP	C2-N3-C4	3.90	121.36	111.83
12	A	601	AGS	PB-O3B-PG	-3.74	119.49	133.17
14	E	500	ADP	C4-N9-C8	3.59	109.51	105.74
12	B	401	AGS	PB-O3B-PG	-3.51	120.32	133.17
14	E	500	ADP	C2'-C1'-N9	-2.86	106.21	113.30
14	E	500	ADP	C4-C5-N7	-2.73	107.46	110.58
14	E	500	ADP	N9-C8-N7	-2.42	110.50	113.94
14	E	500	ADP	C3'-C2'-C1'	2.40	106.00	101.46
14	E	500	ADP	O4'-C1'-N9	2.35	112.61	108.09
14	E	500	ADP	C6-C5-N7	2.31	136.54	132.09
14	E	500	ADP	C5-N7-C8	2.31	107.08	103.45

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
12	A	601	AGS	C5'-O5'-PA-O1A

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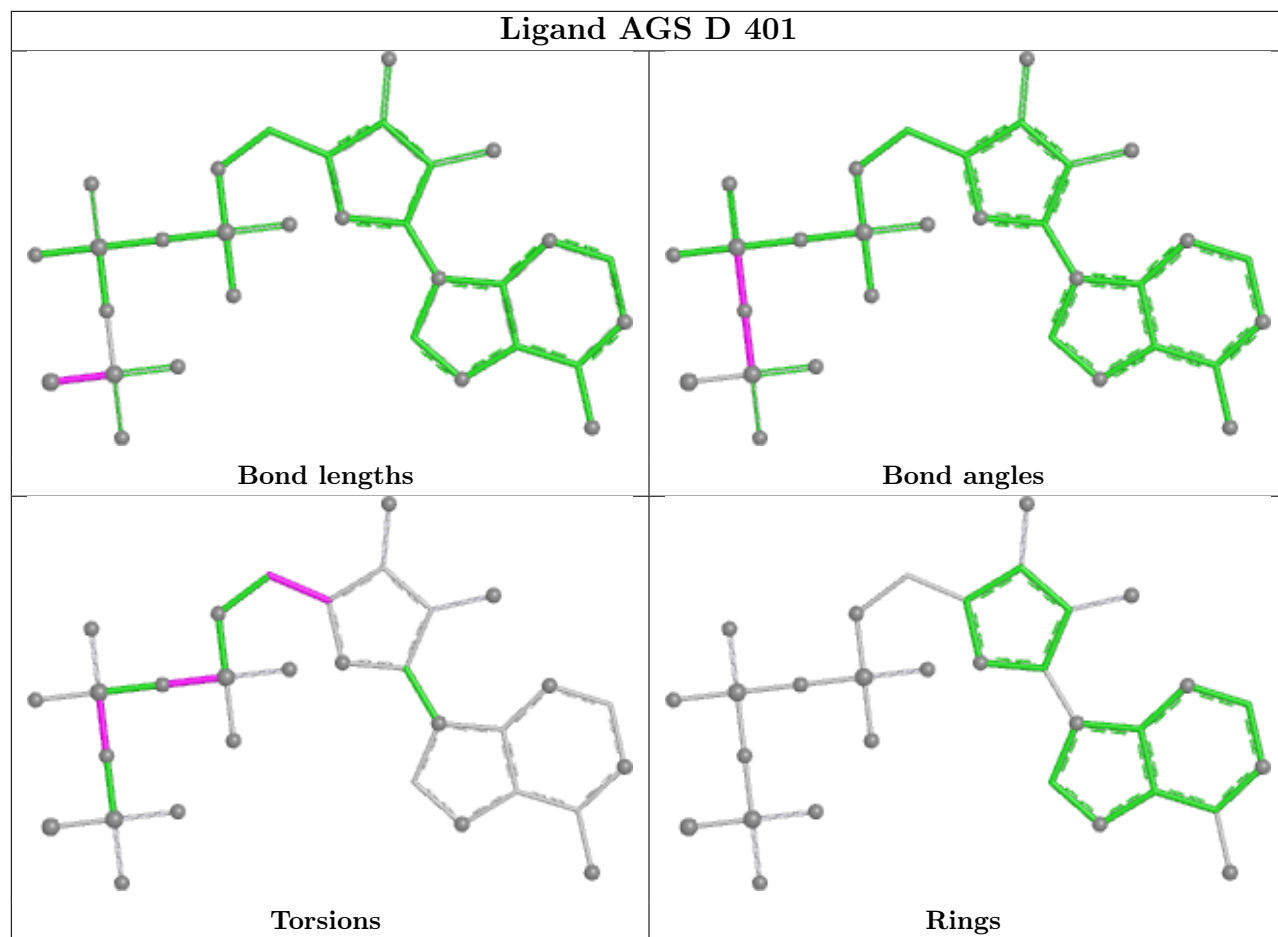
Mol	Chain	Res	Type	Atoms
12	A	601	AGS	C5'-O5'-PA-O3A
12	C	401	AGS	PB-O3B-PG-O2G
14	E	500	ADP	C5'-O5'-PA-O1A
14	E	500	ADP	C5'-O5'-PA-O2A
14	E	500	ADP	C5'-O5'-PA-O3A
12	D	401	AGS	O4'-C4'-C5'-O5'
12	B	401	AGS	C5'-O5'-PA-O1A
12	A	601	AGS	PG-O3B-PB-O2B
12	A	601	AGS	PB-O3A-PA-O2A
12	D	401	AGS	C3'-C4'-C5'-O5'
12	D	401	AGS	PG-O3B-PB-O2B
14	E	500	ADP	O4'-C4'-C5'-O5'
12	D	401	AGS	PB-O3A-PA-O2A

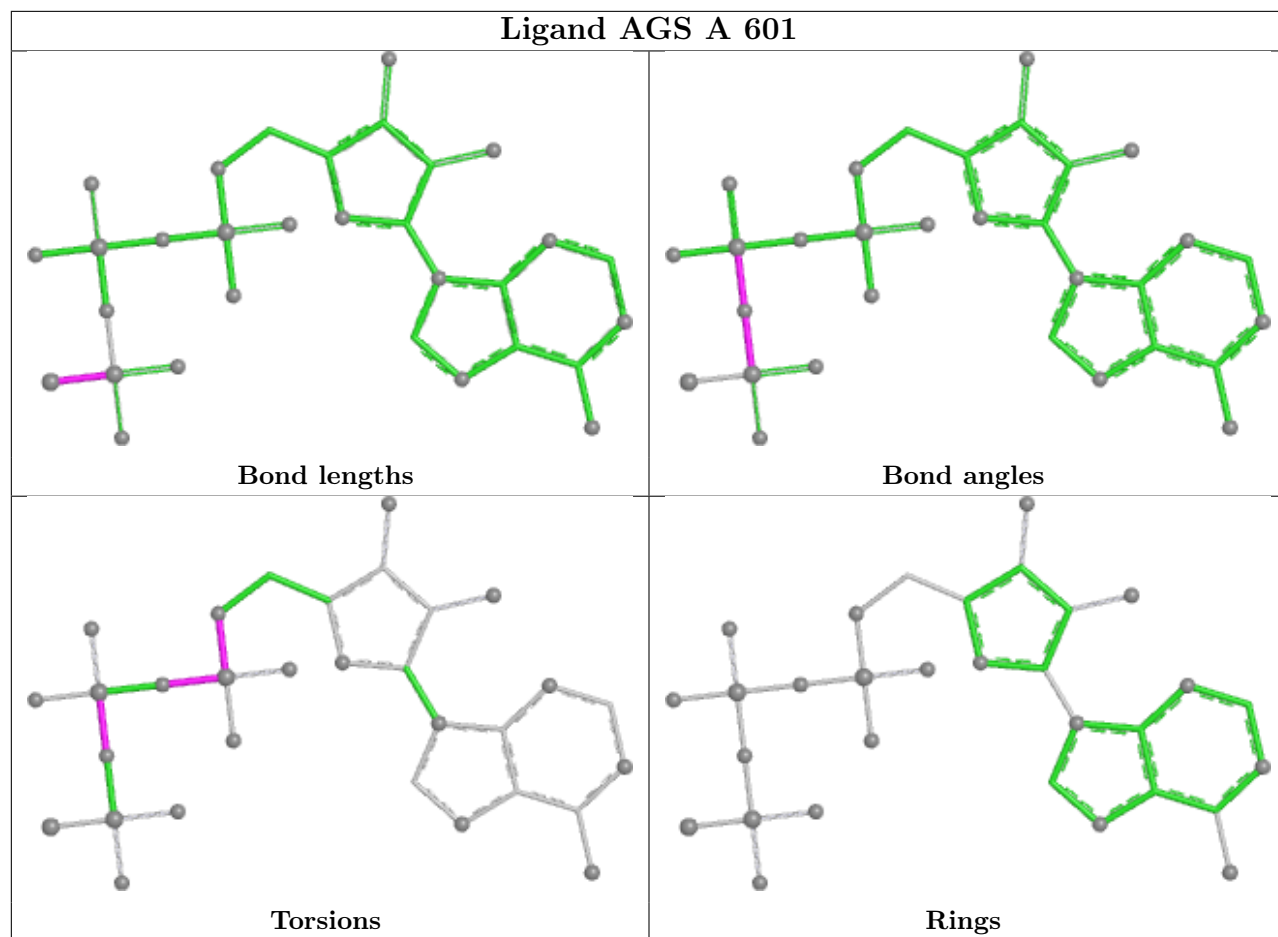
There are no ring outliers.

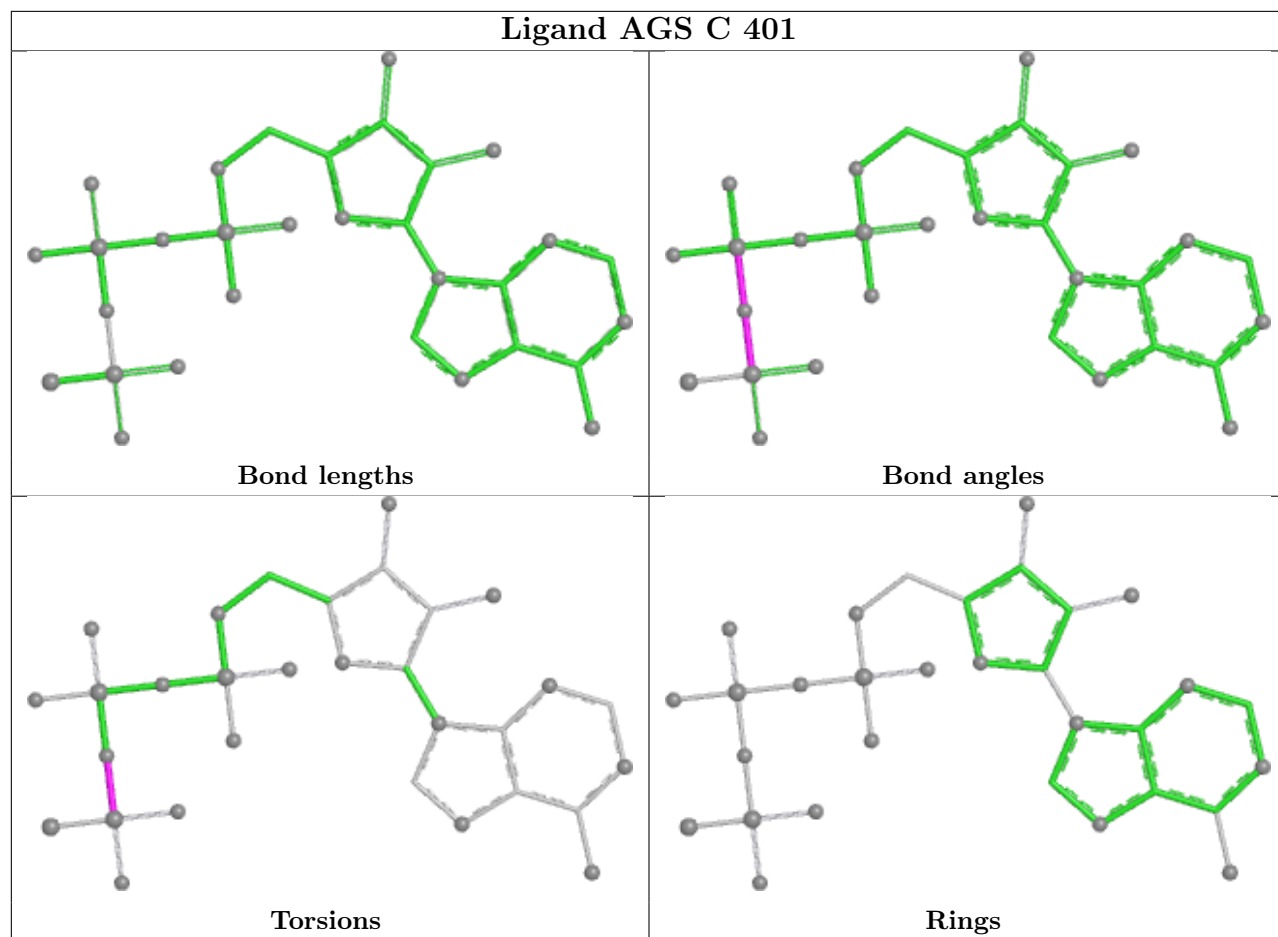
3 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
12	A	601	AGS	2	0
12	C	401	AGS	3	0
12	B	401	AGS	1	0

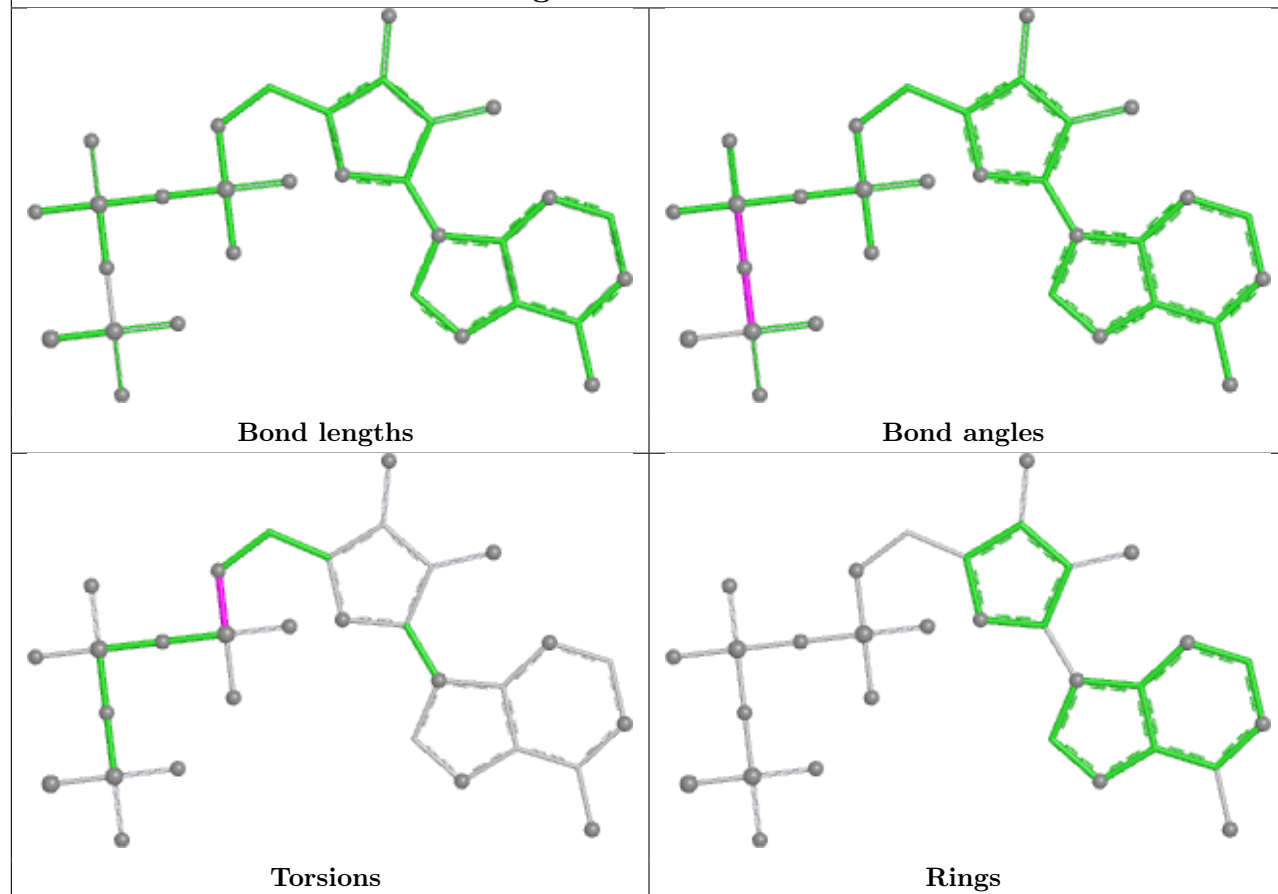
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



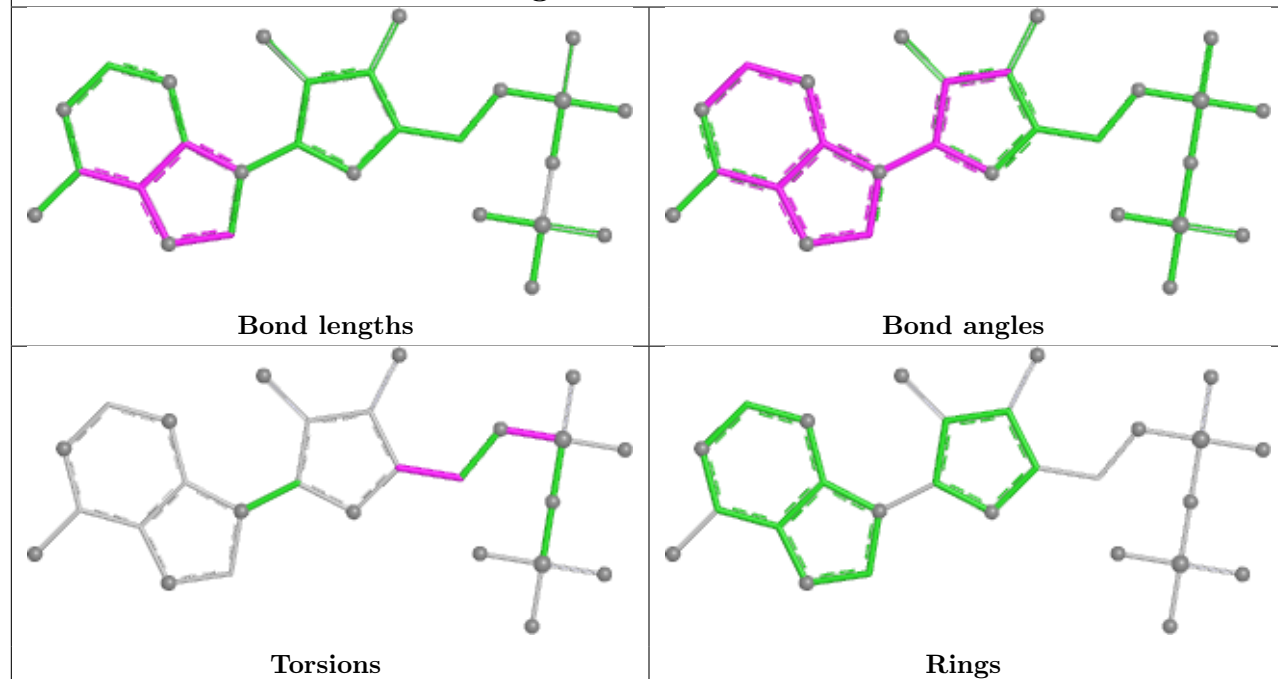




Ligand AGS B 401



Ligand ADP E 500



5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

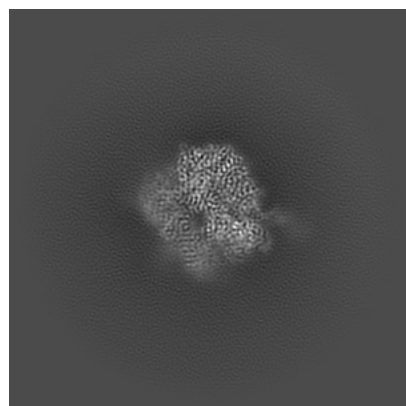
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-29413. These allow visual inspection of the internal detail of the map and identification of artifacts.

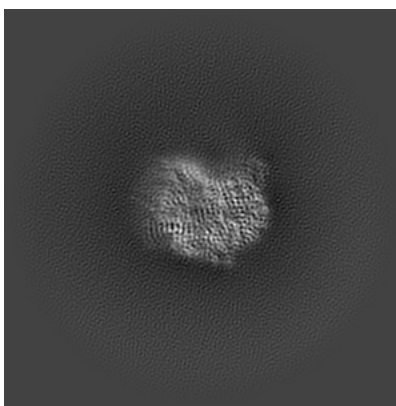
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

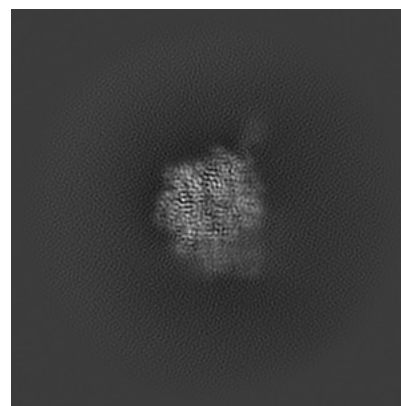
6.1.1 Primary map



X

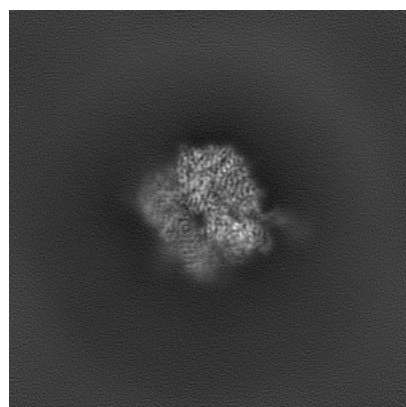


Y

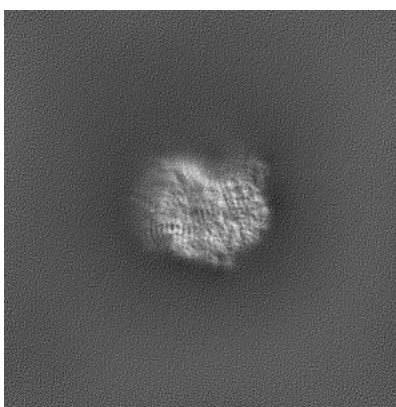


Z

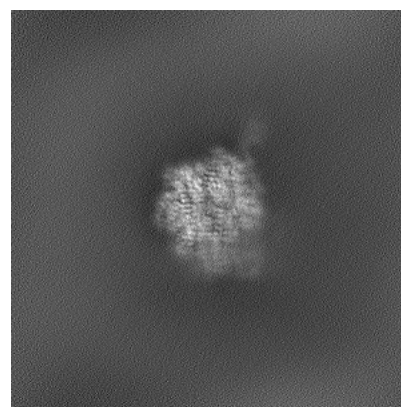
6.1.2 Raw map



X



Y

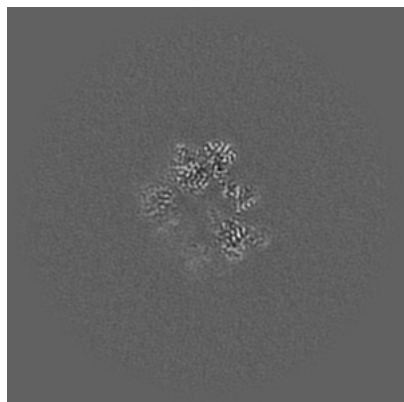


Z

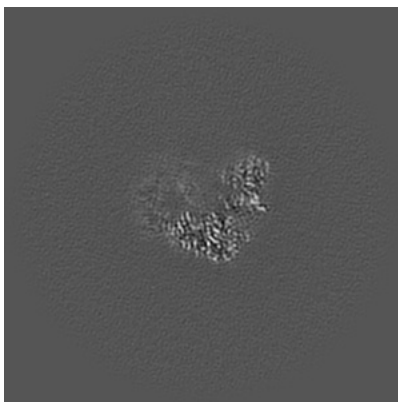
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

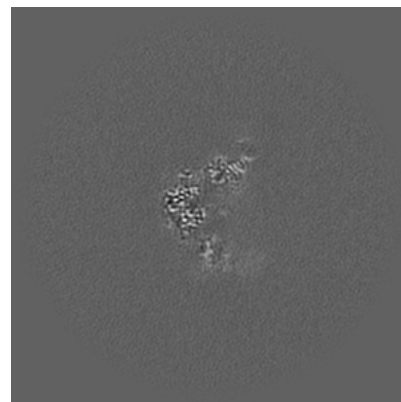
6.2.1 Primary map



X Index: 210

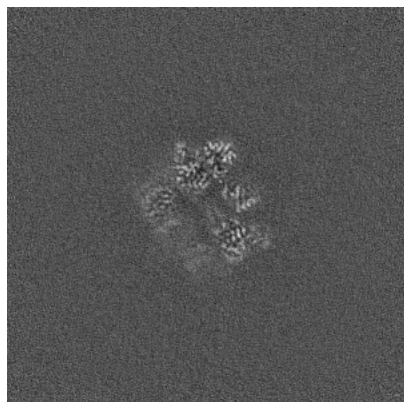


Y Index: 210

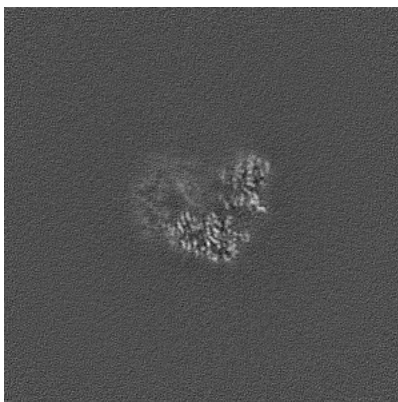


Z Index: 210

6.2.2 Raw map



X Index: 210



Y Index: 210

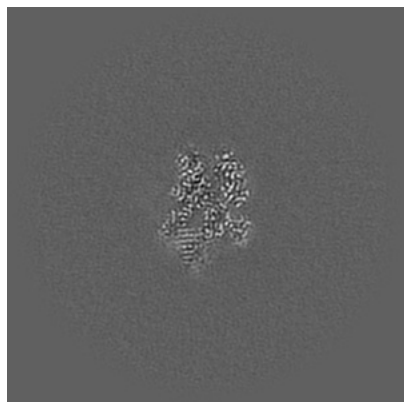


Z Index: 210

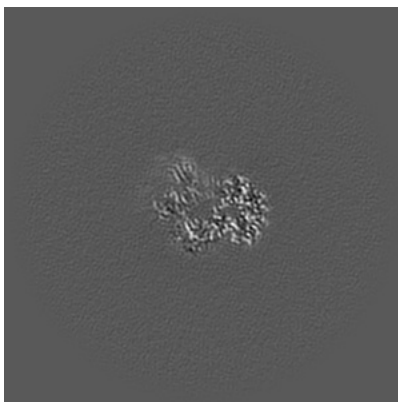
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

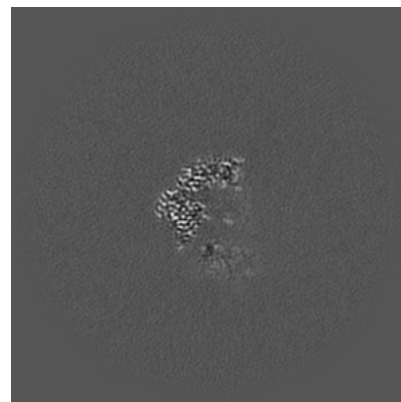
6.3.1 Primary map



X Index: 188

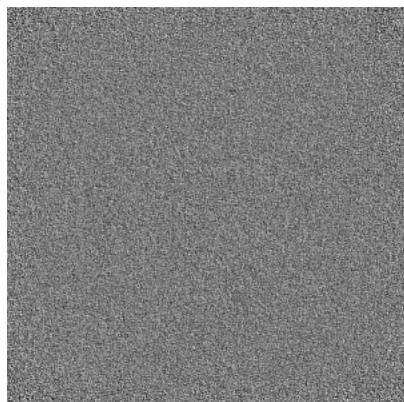


Y Index: 230

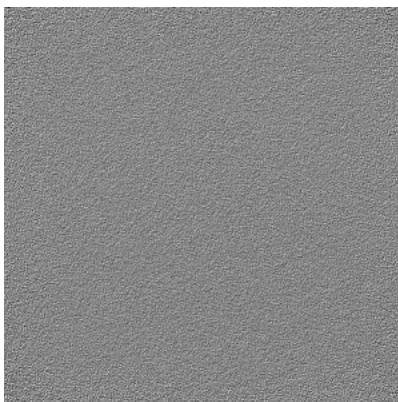


Z Index: 219

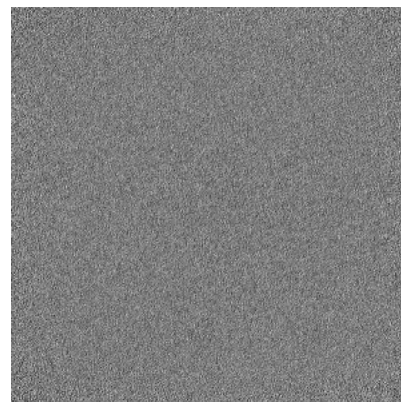
6.3.2 Raw map



X Index: 0



Y Index: 0

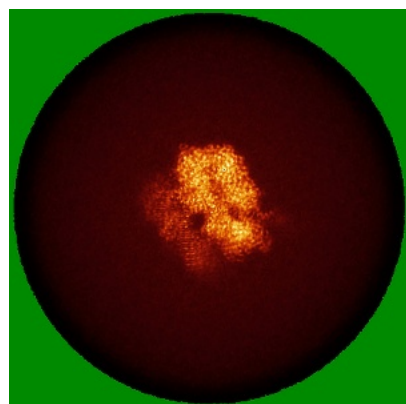


Z Index: 0

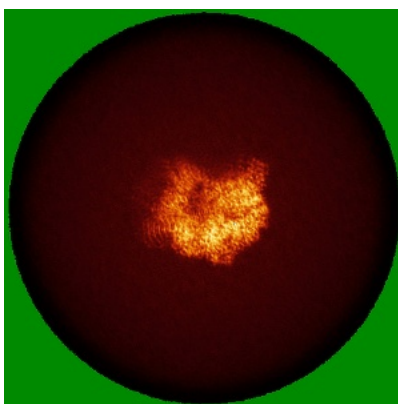
The images above show the largest variance slices of the map in three orthogonal directions.

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

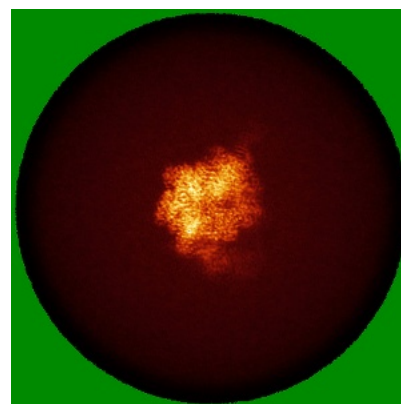
6.4.1 Primary map



X

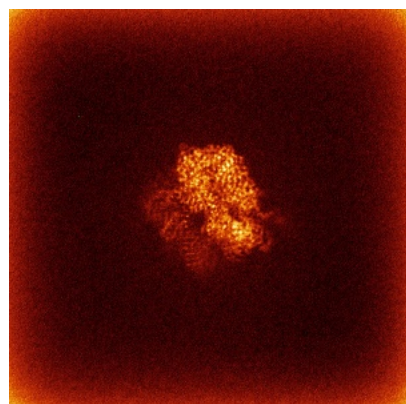


Y

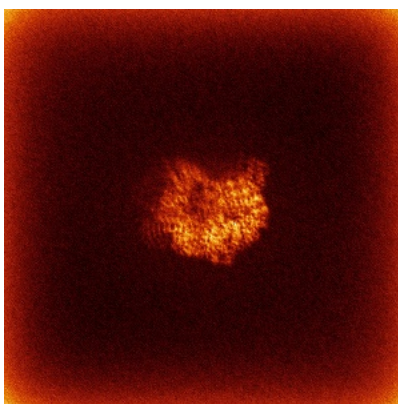


Z

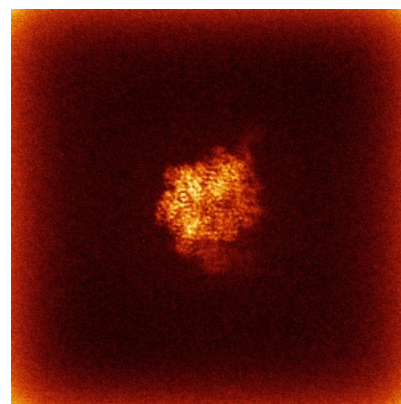
6.4.2 Raw map



X



Y

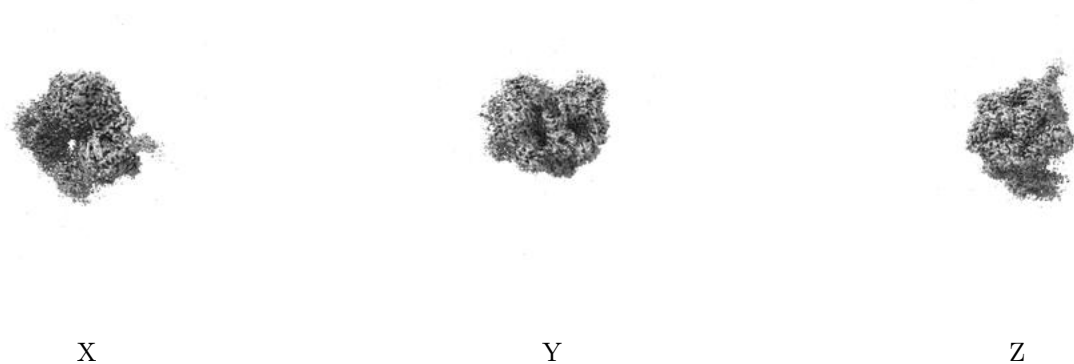


Z

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.

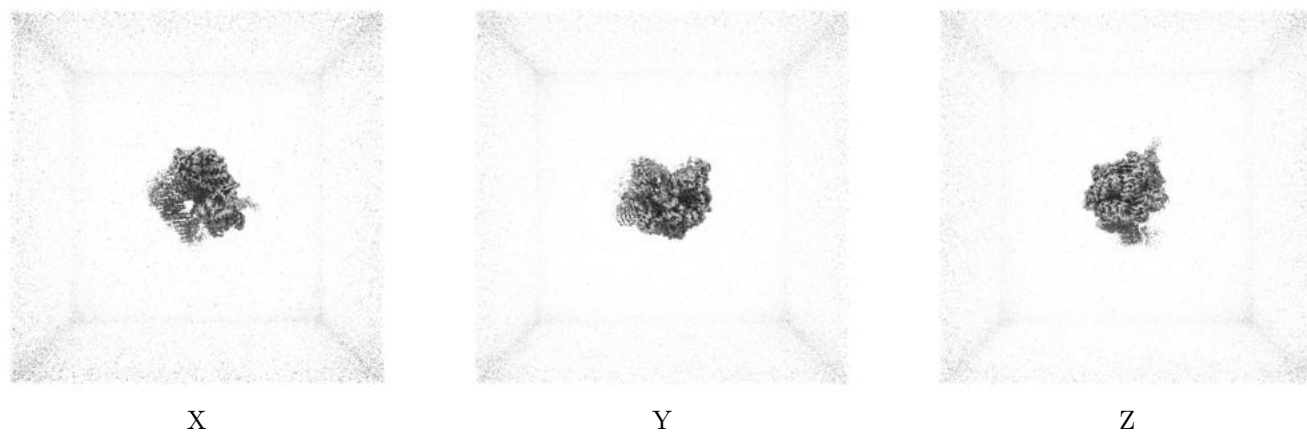
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.12. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



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

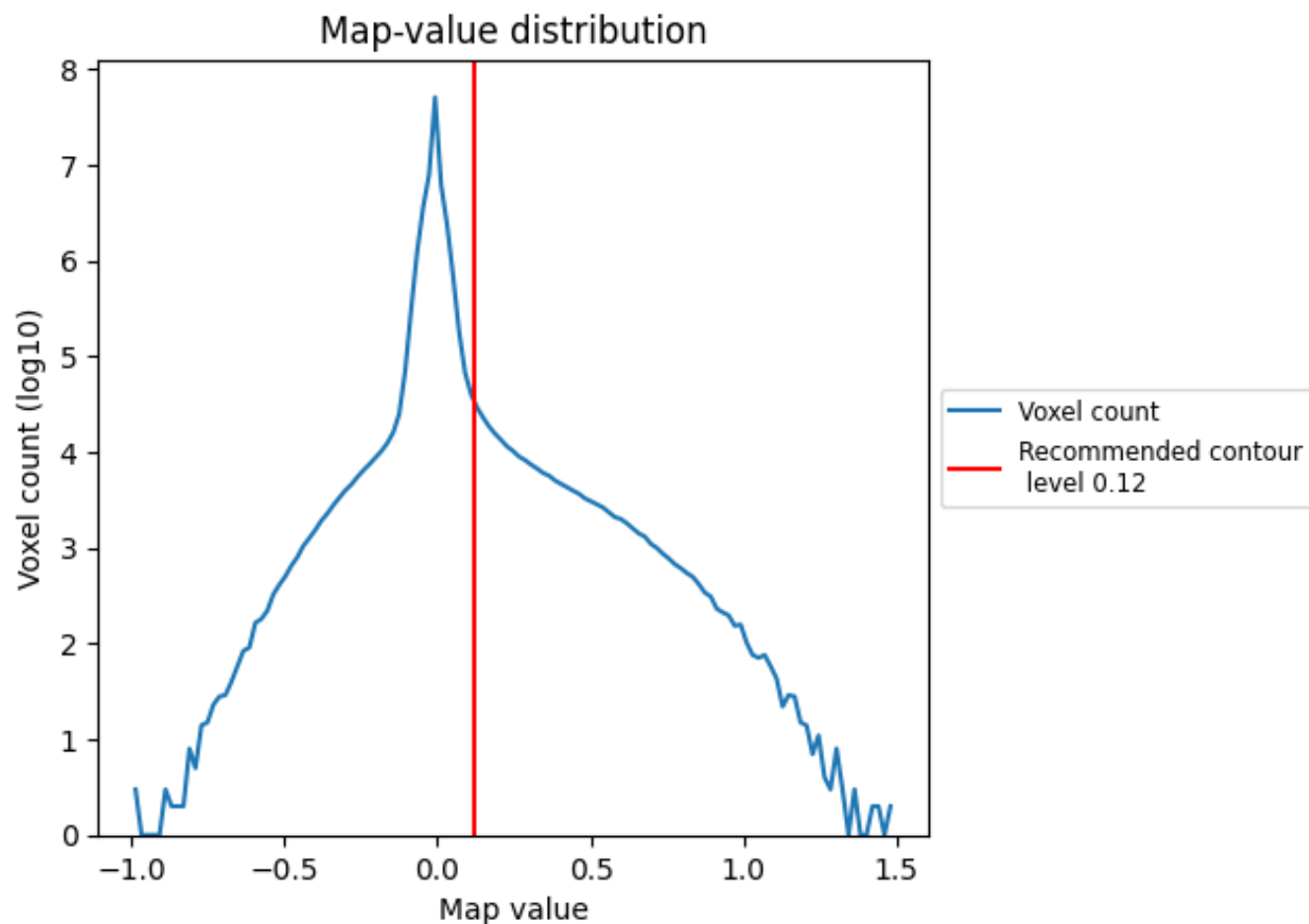
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

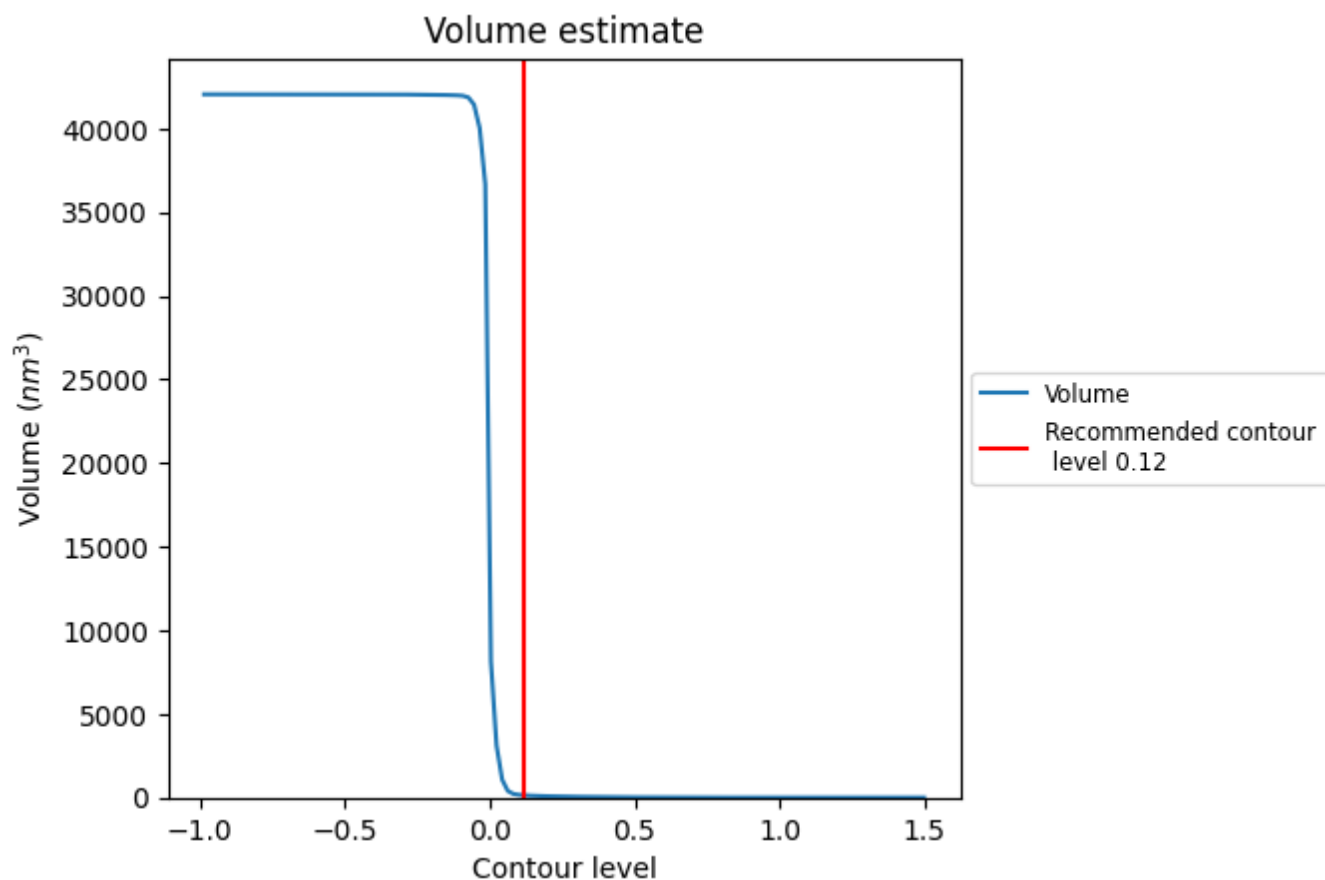
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

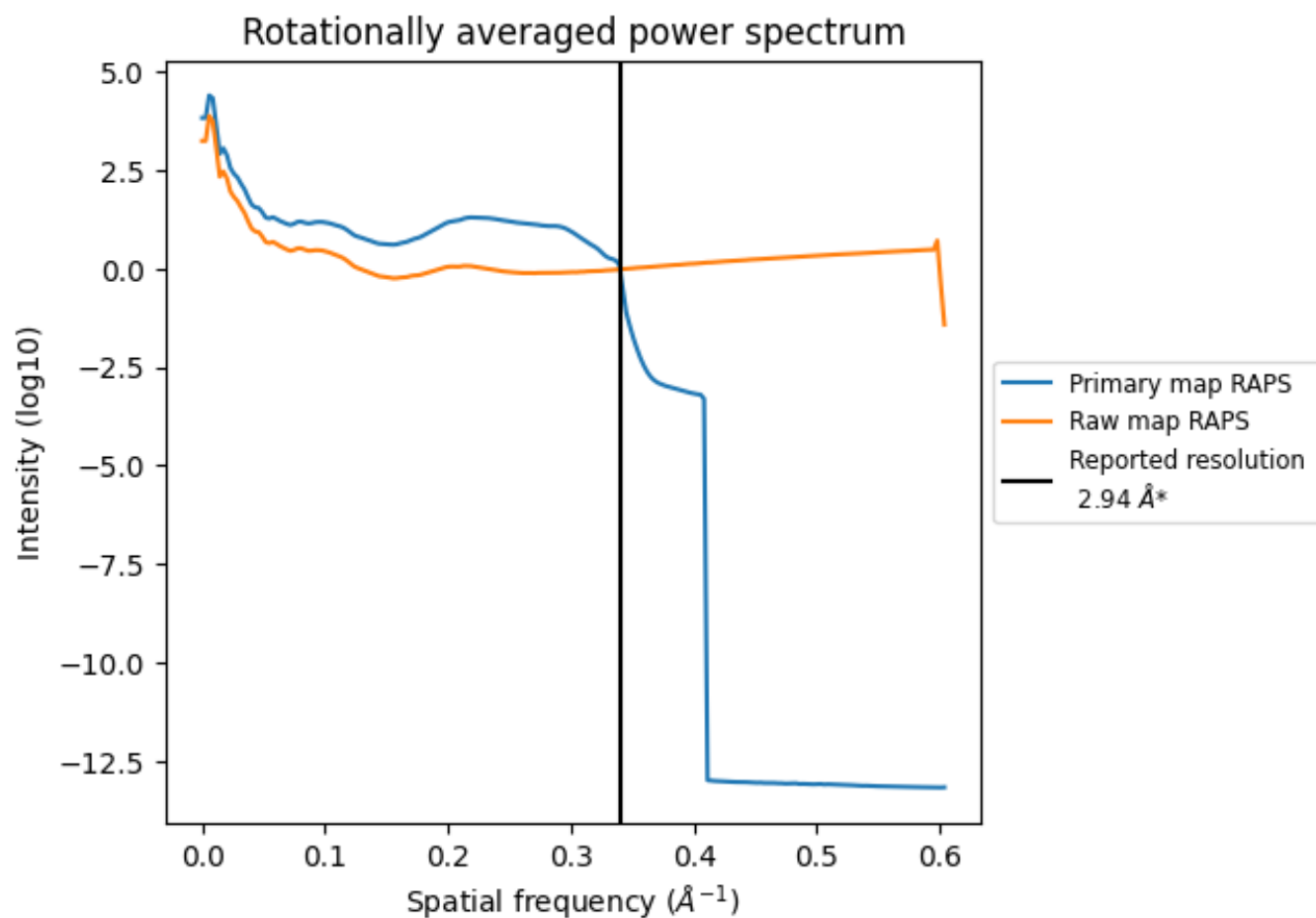
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 134 nm^3 ; this corresponds to an approximate mass of 121 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 ⓘ

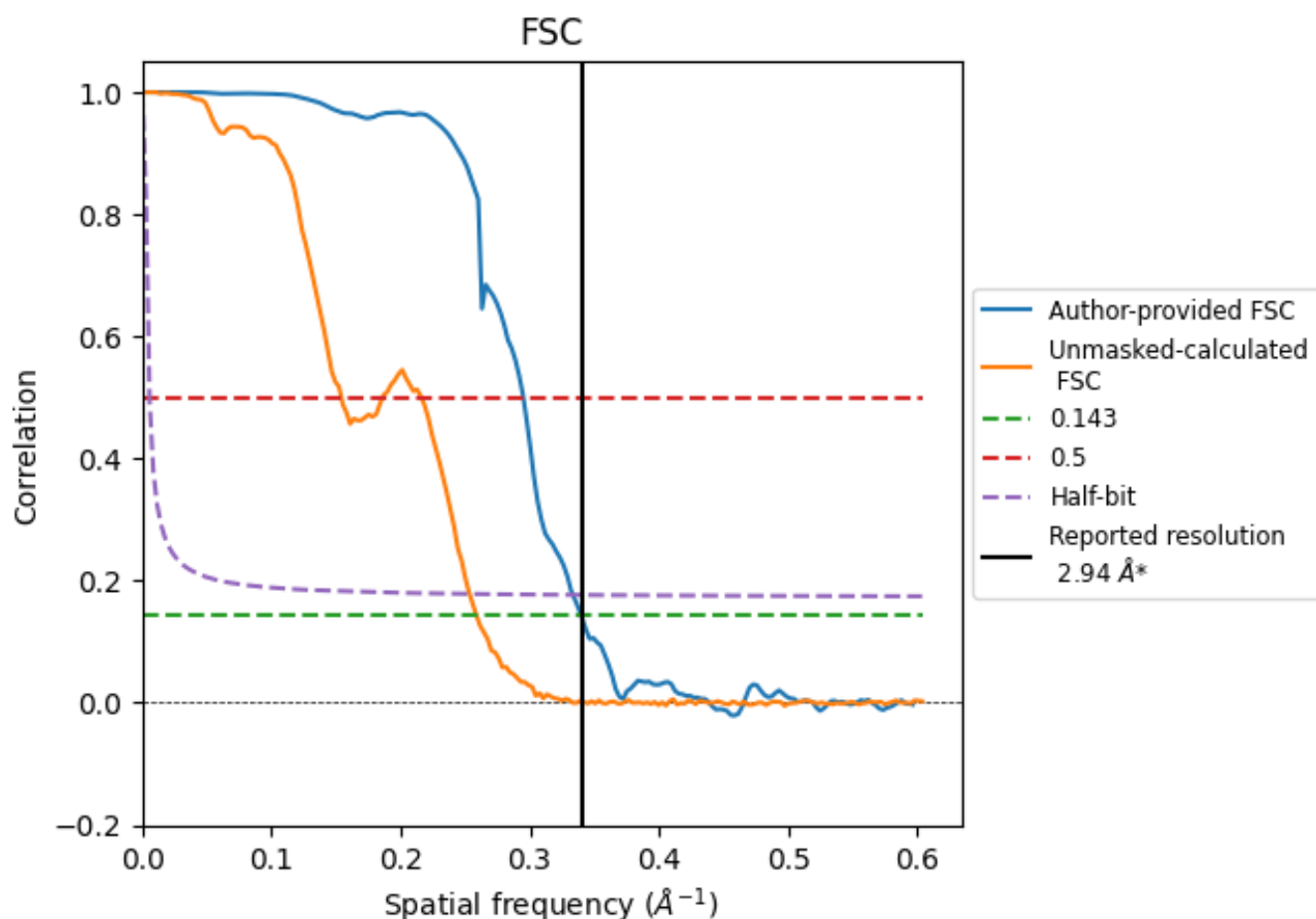


*Reported resolution corresponds to spatial frequency of 0.340 $\text{\AA}^{-1}$

8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.340 $\text{\AA}^{-1}$

8.2 Resolution estimates [i](#)

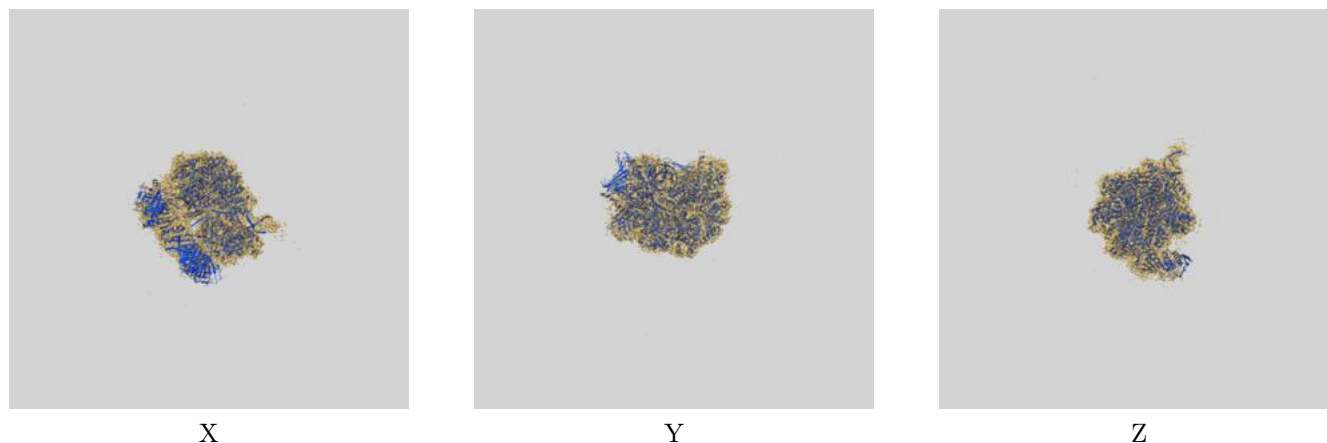
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.94	-	-
Author-provided FSC curve	2.94	3.39	3.00
Unmasked-calculated*	3.86	6.49	3.94

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.86 differs from the reported value 2.94 by more than 10 %

9 Map-model fit [i](#)

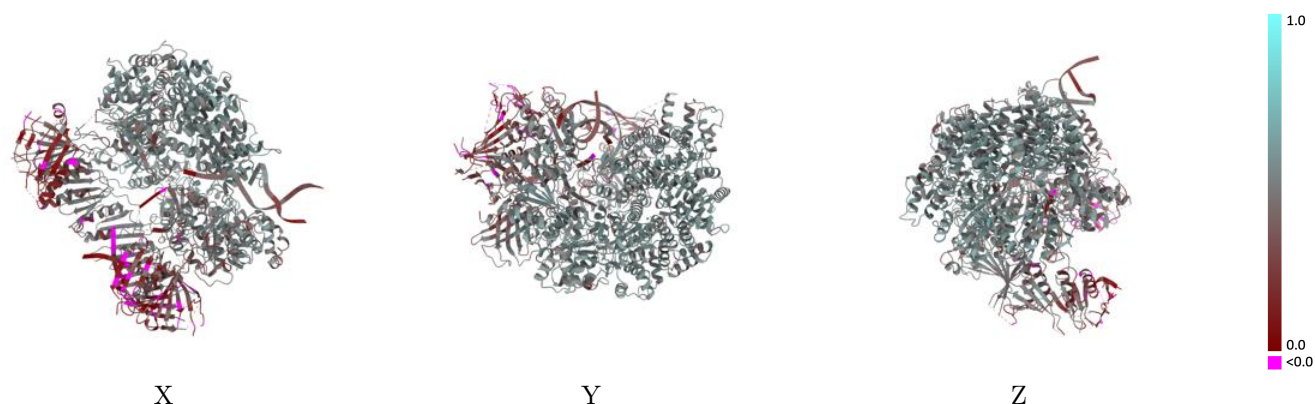
This section contains information regarding the fit between EMDB map EMD-29413 and PDB model 8FS4. Per-residue inclusion information can be found in [section 3](#) on [page 8](#).

9.1 Map-model overlay [i](#)



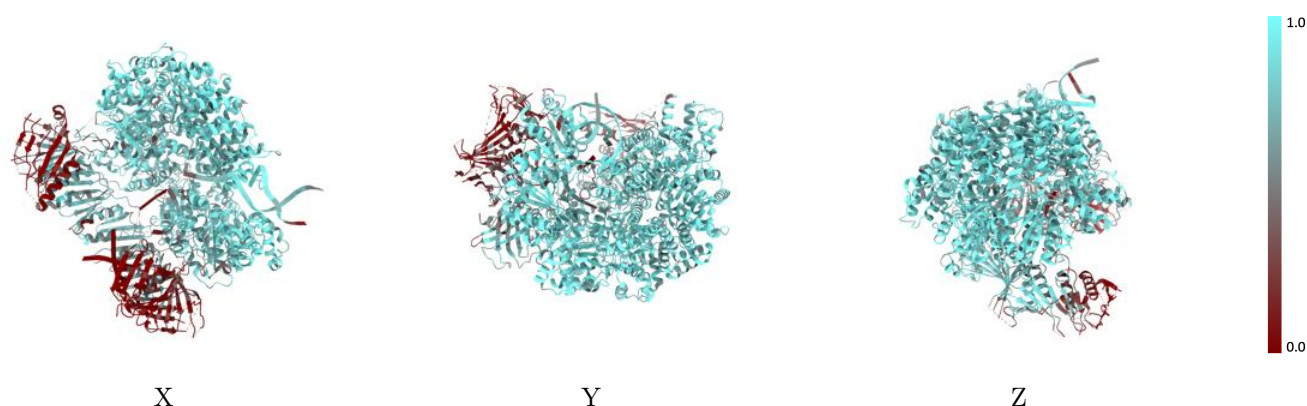
The images above show the 3D surface view of the map at the recommended contour level 0.12 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



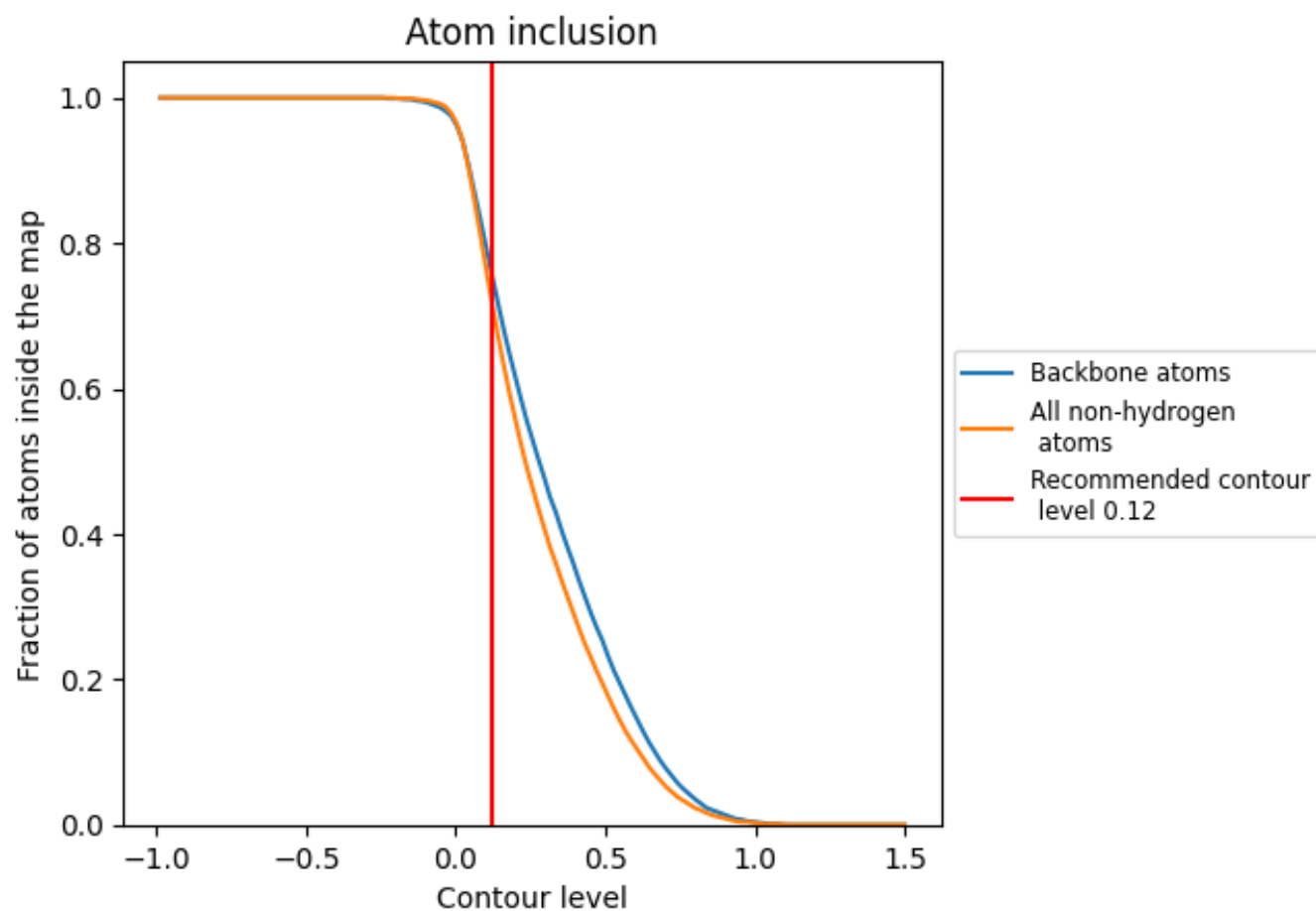
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

9.3 Atom inclusion mapped to coordinate model [i](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.12).

9.4 Atom inclusion [i](#)



At the recommended contour level, 76% of all backbone atoms, 72% 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 (0.12) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7190	 0.4520
A	 0.7920	 0.4720
B	 0.8830	 0.5290
C	 0.8800	 0.5270
D	 0.9160	 0.5530
E	 0.8620	 0.5140
F	 0.4390	 0.3340
G	 0.6970	 0.4300
H	 0.1340	 0.2200
I	 0.5160	 0.2910
J	 0.0200	 0.0750
K	 0.7210	 0.3680

