



Full wwPDB EM Validation Report ⓘ

Mar 29, 2026 – 06:15 AM UTC

PDB ID : 8WPE / pdb_00008wpe
EMDB ID : EMD-37714
Title : Structure of monkeypox virus polymerase complex F8-A22-E4-H5 (tag-free A22) with exogenous DNA
Authors : Wang, X.; Li, N.; Gao, N.
Deposited on : 2023-10-10
Resolution : 2.70 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:

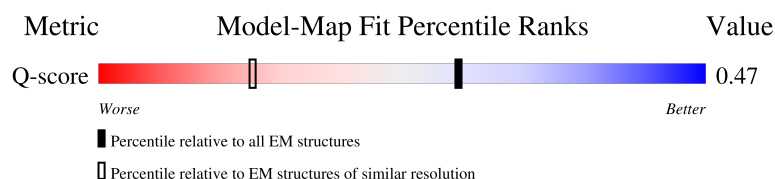
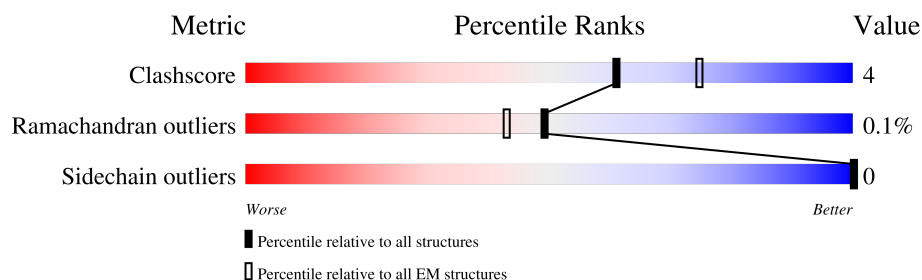
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data 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

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

The reported resolution of this entry is 2.70 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	10327 (2.20 - 3.20)

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

Mol	Chain	Length	Quality of chain
1	A	1006	5% 85% 15%
2	B	426	21% 90% 10%
3	C	218	5% 89% 11%
4	D	210	15% 28% 5% 67%

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Mol	Chain	Length	Quality of chain
4	E	210	10%25%73%
4	F	210	30%29%69%
4	G	210	26%22%5%73%
5	H	35	26%74%14%11%
6	I	48	19%65%12%23%

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 16745 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 DNA polymerase.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	1006	Total	C	N	O	S	0	0
			8223	5250	1376	1542	55		

- Molecule 2 is a protein called A22R DNA polymerase processivity factor.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	426	Total	C	N	O	S	0	0
			3468	2231	561	665	11		

- Molecule 3 is a protein called E4R Uracil-DNA glycosylase, DNA polymerase processivity factor.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	218	Total	C	N	O	S	0	0
			1773	1149	292	326	6		

- Molecule 4 is a protein called H5R late gene transcription factor.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	69	Total	C	N	O	S	0	0
			525	327	93	104	1		
4	E	57	Total	C	N	O	S	0	0
			425	265	71	88	1		
4	F	65	Total	C	N	O	S	0	0
			481	302	81	97	1		
4	G	57	Total	C	N	O	S	0	0
			425	265	71	88	1		

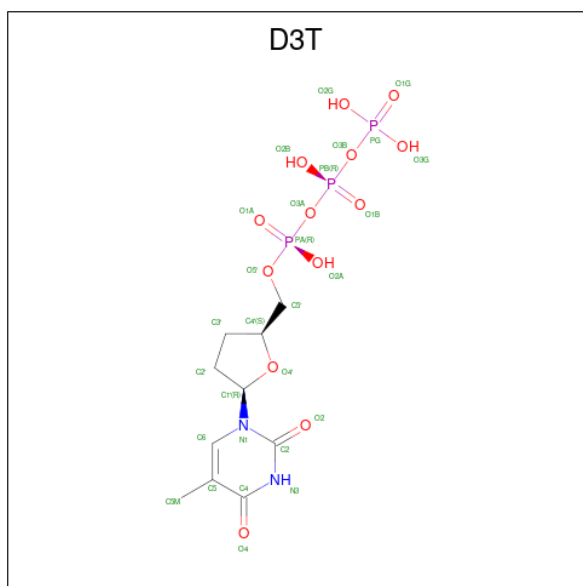
- Molecule 5 is a DNA chain called Primer DNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	H	31	Total	C	N	O	P	0	0
			638	303	120	184	31		

- Molecule 6 is a DNA chain called Template DNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	I	37	Total	C	N	O	P	0	0
			758	361	140	220	37		

- Molecule 7 is 2',3'-DIDEOXY-THYMIDINE-5'-TRIPHOSPHATE (CCD ID: D3T) (formula: $C_{10}H_{17}N_2O_{13}P_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
7	A	1	Total	C	N	O	P	0
			28	10	2	13	3	

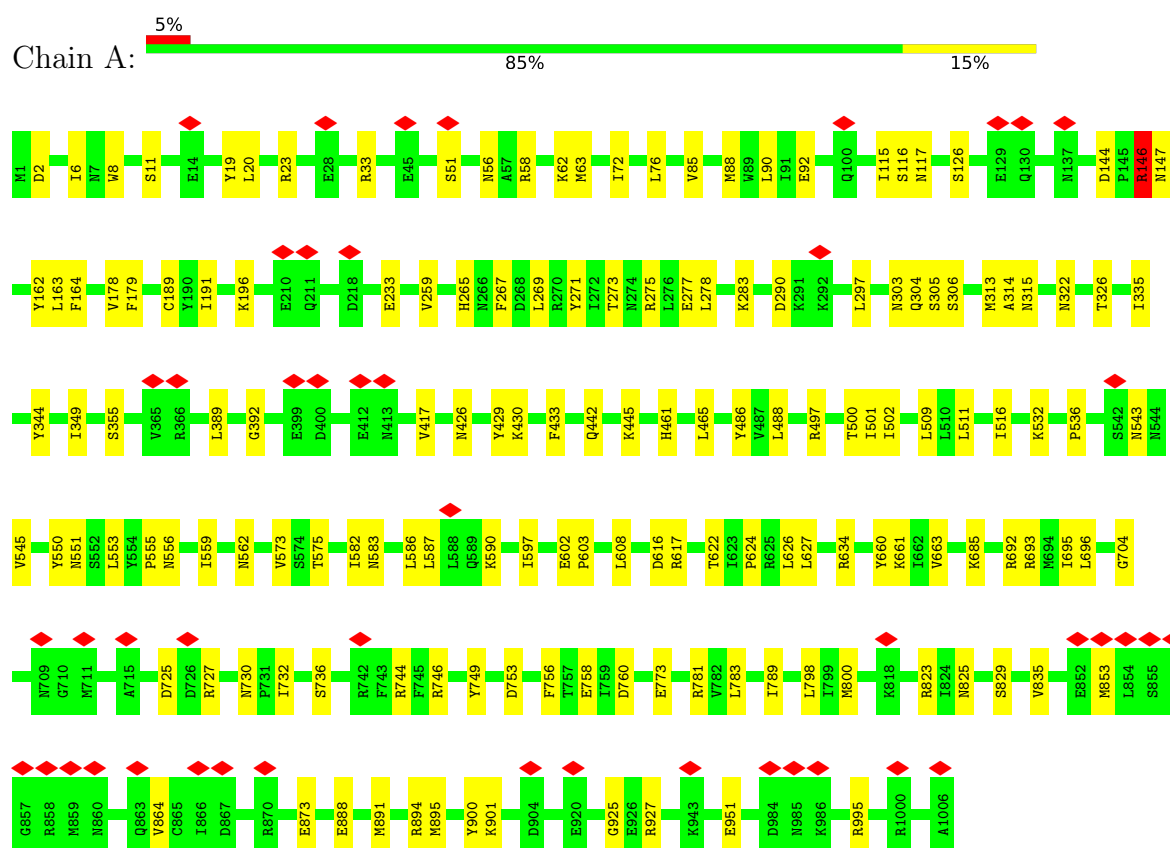
- Molecule 8 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

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

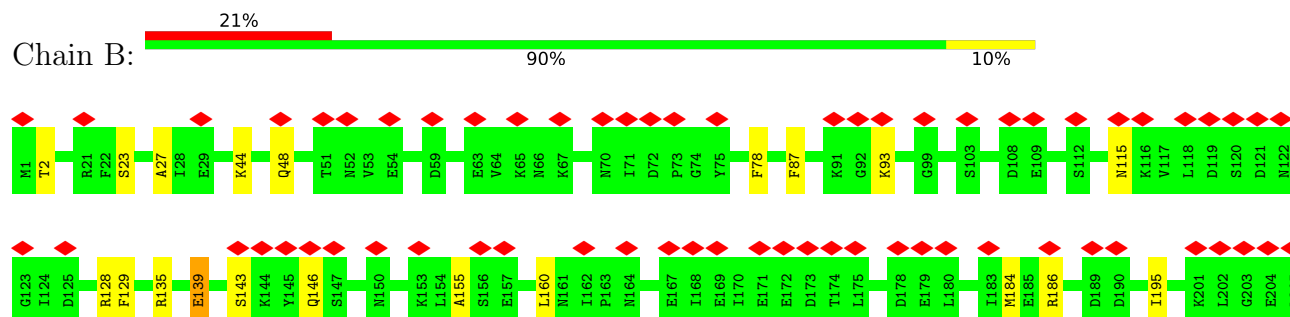
3 Residue-property plots

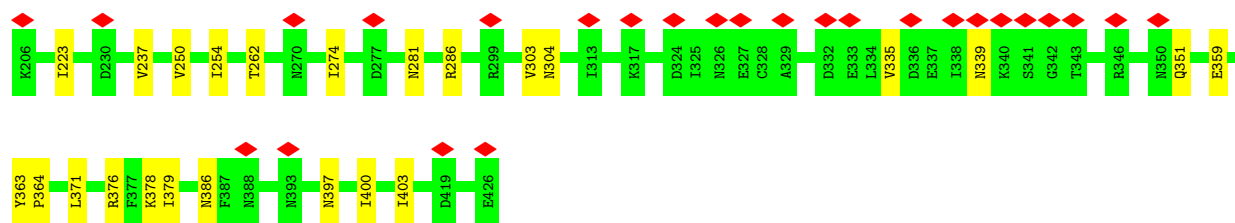
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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: DNA polymerase

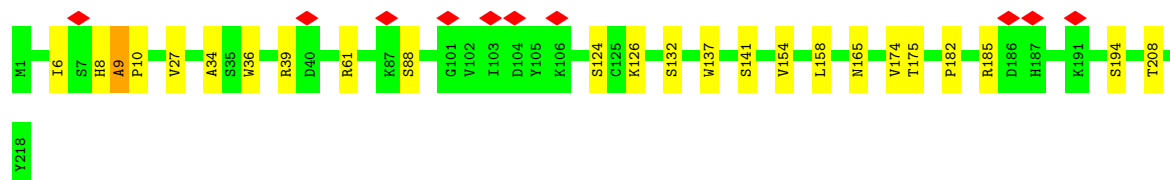
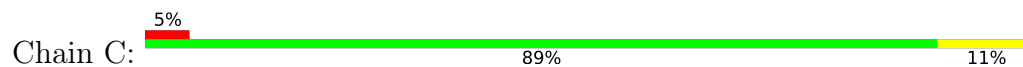


- Molecule 2: A22R DNA polymerase processivity factor

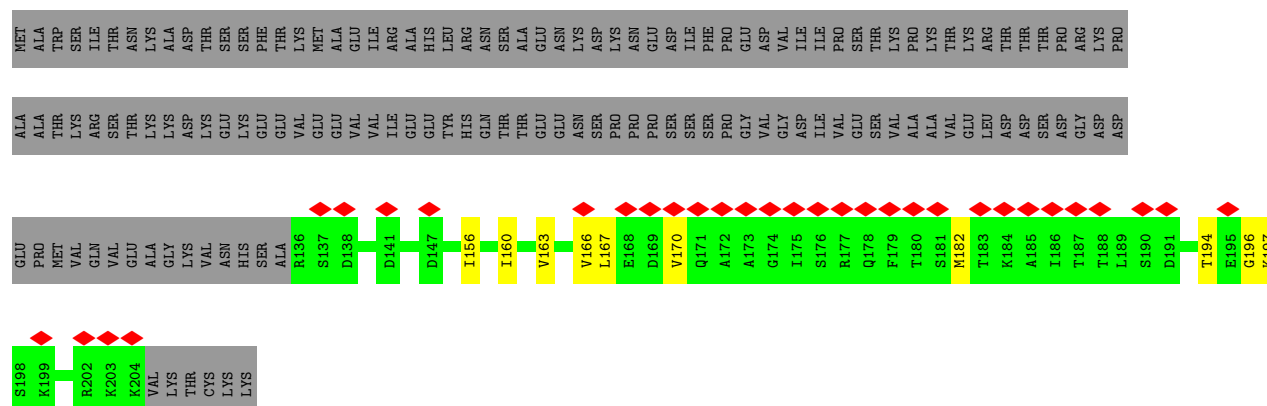




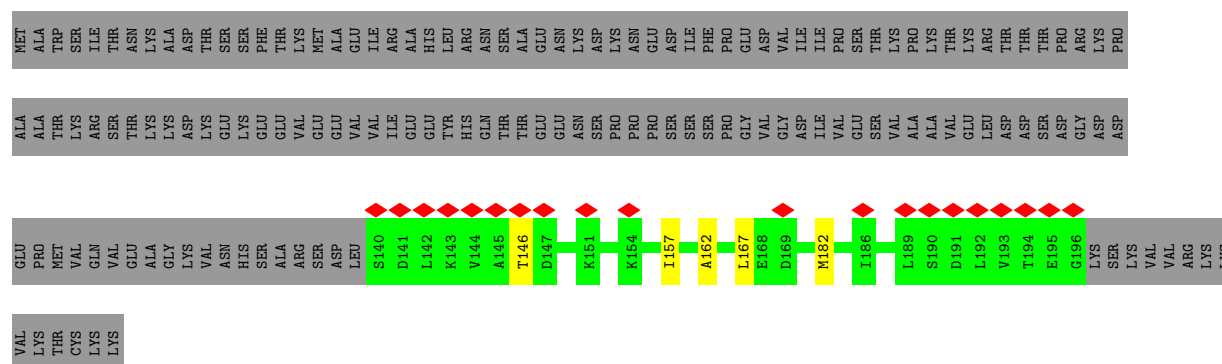
- Molecule 3: E4R Uracil-DNA glycosylase, DNA polymerase processivity factor



- Molecule 4: H5R late gene transcription factor



- Molecule 4: H5R late gene transcription factor



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

ALA THR LYS ARG SER THR LYS LYS ASP GLU LYS GLU VAL ARG MET GLU VAL VAL ILE GLU GLU TYR HIS GLN THR THR GLU ASN SER PRO PRO PRO SER SER SER PRO GLY VAL GLY ASP ILE VAL VAL SER THR LYS THR ASP ASP GLY ASP ASP

GLU PRO MET VAL GLN VAL GLU ALA GLY LYS VAL ASN HIS SER THR ALA ARG MET ASP L139 S140 D141 L142 K143 V144 T145 T146 D147 N148 I149 V150 K151 D152 L153 K154 K155 I156 V157 I158 T159 I160 S161 A162 V163 S164 T165 V166 L167 E168 D169 V170 Q171 A172 A173 G174 I175 S176 R177 Q178 F179 T180

S181 M182 T183 K184 A185 I186 T187 T188 L189 S190 D191 L192 L193 T194 T195 E196 G197 S198 K199 V200 V201 R202 K203 LYS VAL LYS THR CYS LYS

• Molecule 4: H5R late gene transcription factor



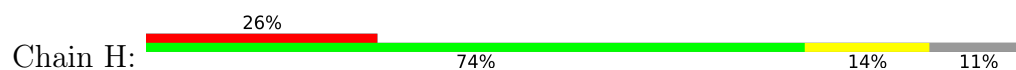
MET ALA TRP MET LYS SER ILE THR ASN LYS ALA ASP THR SER PHE THR LYS MET ALA GLU ILE ARG ALA HIS LEU ARG ASN SER SER ALA GLU ASN LYS ASP LYS ASN PRO GLU ASP ILE PHE PRO GLU ASP VAL GLY ASP ILE ILE PRO SER THR LYS PRO LYS THR LYS THR ARG THR PRO ARG LYS PRO

ALA THR LYS ARG SER THR LYS LYS ASP GLU LYS GLU VAL ARG MET ASP LYS VAL ILE ARG ALA GLU TYR HIS GLN THR THR GLU ASN SER PRO PRO PRO SER SER SER PRO GLY VAL GLY ASP ILE ILE VAL VAL SER THR LYS THR ASP ASP GLY ASP ASP

GLU PRO MET VAL GLN VAL GLU ALA GLY LYS VAL ASN HIS SER THR ALA ARG MET ASP LYS LEU S140 D141 L142 K143 V144 T145 T146 D147 N148 I149 V150 K151 D152 L153 K154 K155 I156 V157 I158 T159 I160 S161 A162 V163 S164 T165 V166 L167 E168 D169 V170 Q171 A172 A173 G174 I175 S176 R177 Q178 F179 T180

S181 M182 T183 K184 A185 I186 T187 T188 L189 S190 D191 L192 L193 T194 T195 E196 G197 LYS SER LYS VAL VAL ARG LYS LYS VAL LYS THR CYS LYS

• Molecule 5: Primer DNA



DA DT DT DT C5 C6 C7 C8 C9 G10 A11 G12 G13 C29 A30 A31 T32 T33 G34 C35

• Molecule 6: Template DNA



DC DT DG DC DA DC G7 A6 A9 T11 A12 A13 G14 C32 A33 G36 C37 T38 C39 C40 C41 C42 C43 G44 DA DA DA DT

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	1660000	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	59.5	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.199	Depositor
Minimum map value	-0.126	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.004	Depositor
Recommended contour level	0.016	Depositor
Map size (Å)	249.0, 249.0, 249.0	wwPDB
Map dimensions	300, 300, 300	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.83, 0.83, 0.83	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: D3T, 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	0/8399	0.47	1/11339 (0.0%)
2	B	0.24	0/3535	0.54	2/4769 (0.0%)
3	C	0.24	0/1823	0.56	1/2479 (0.0%)
4	D	0.33	0/525	0.74	1/704 (0.1%)
4	E	0.24	0/425	0.51	0/574
4	F	0.25	0/481	0.59	0/649
4	G	0.25	0/425	0.56	0/574
5	H	0.85	7/716 (1.0%)	0.83	3/1103 (0.3%)
6	I	0.20	0/849	0.43	0/1305
All	All	0.29	7/17178 (0.0%)	0.53	8/23496 (0.0%)

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	A	0	1
2	B	0	1
All	All	0	2

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	H	35	DC	C4'-C3'	-9.90	1.32	1.52
5	H	35	DC	C4'-O4'	8.10	1.61	1.45
5	H	35	DC	C5-C6	7.98	1.50	1.34
5	H	35	DC	O4'-C1'	-6.60	1.28	1.41
5	H	35	DC	C2-N3	6.54	1.49	1.36
5	H	35	DC	N3-C4	6.38	1.46	1.33
5	H	35	DC	C4-N4	6.19	1.46	1.34

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	H	34	DG	P-O3'-C3'	-16.48	95.47	120.20
5	H	34	DG	OP2-P-O3'	10.35	139.04	108.00
4	D	156	ILE	CG1-CB-CG2	-8.36	85.62	110.70
5	H	34	DG	OP1-P-O3'	-7.28	86.15	108.00
2	B	48	GLN	CA-CB-CG	6.33	126.76	114.10
3	C	9	ALA	CB-CA-C	5.87	121.73	110.17
1	A	146	ARG	CG-CD-NE	5.36	123.80	112.00
2	B	139	GLU	CB-CA-C	-5.05	102.88	110.92

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	146	ARG	Sidechain
2	B	135	ARG	Sidechain

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	8223	0	8178	91	0
2	B	3468	0	3469	25	0
3	C	1773	0	1764	16	0
4	D	525	0	575	7	0
4	E	425	0	454	5	0
4	F	481	0	518	5	0
4	G	425	0	454	7	0
5	H	638	0	347	3	0
6	I	758	0	418	6	0
7	A	28	0	13	0	0
8	A	1	0	0	0	0
All	All	16745	0	16190	146	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 4.

All (146) close contacts within the same asymmetric unit are listed below, sorted by their clash

magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:128:ARG:HD3	2:B:139:GLU:HG2	1.65	0.78
1:A:543:ASN:HD21	1:A:760:ASP:HA	1.60	0.65
1:A:783:LEU:HD11	1:A:789:ILE:HG23	1.78	0.65
1:A:461:HIS:O	1:A:465:LEU:HB2	1.97	0.64
1:A:315:ASN:HD22	1:A:925:GLY:HA3	1.63	0.63
6:I:36:DG:H2''	6:I:37:DC:H2'	1.82	0.62
1:A:553:LEU:HD22	1:A:753:ASP:HB3	1.82	0.61
1:A:164:PHE:HB2	1:A:189:CYS:HB3	1.82	0.61
1:A:6:ILE:HD11	1:A:23:ARG:HB2	1.85	0.59
1:A:442:GLN:HA	1:A:445:LYS:HD2	1.85	0.59
3:C:158:LEU:HD12	3:C:182:PRO:HD3	1.86	0.58
1:A:597:ILE:HB	1:A:617:ARG:HH11	1.69	0.57
1:A:11:SER:HB2	1:A:19:TYR:HE1	1.69	0.57
3:C:6:ILE:HD11	3:C:10:PRO:HD2	1.87	0.56
1:A:888:GLU:HA	1:A:891:MET:HE2	1.87	0.56
4:G:182:MET:HE3	4:G:186:ILE:HD12	1.88	0.56
1:A:853:MET:HE2	1:A:864:VAL:HG22	1.86	0.56
1:A:278:LEU:O	3:C:39:ARG:NH1	2.39	0.55
4:D:196:GLY:HA3	4:E:157:ILE:HD12	1.87	0.55
1:A:76:LEU:HD22	1:A:586:LEU:HB3	1.88	0.55
1:A:305:SER:HA	1:A:313:MET:HA	1.89	0.55
1:A:322:ASN:ND2	1:A:326:THR:O	2.38	0.54
2:B:281:ASN:ND2	4:E:167:LEU:O	2.41	0.54
2:B:351:GLN:NE2	2:B:359:GLU:OE1	2.41	0.53
1:A:178:VAL:O	1:A:275:ARG:NH1	2.40	0.53
1:A:551:ASN:O	1:A:556:ASN:ND2	2.41	0.53
1:A:545:VAL:HG21	1:A:798:LEU:HD22	1.91	0.53
1:A:894:ARG:NH2	1:A:951:GLU:OE1	2.38	0.53
2:B:254:ILE:HG21	2:B:286:ARG:HG3	1.90	0.53
1:A:56:ASN:HB3	1:A:92:GLU:HB2	1.91	0.53
1:A:704:GLY:HA2	1:A:744:ARG:HH22	1.74	0.53
1:A:727:ARG:NH1	1:A:781:ARG:O	2.43	0.52
1:A:730:ASN:O	1:A:781:ARG:NH2	2.42	0.52
2:B:223:ILE:HG13	2:B:237:VAL:HG23	1.90	0.52
1:A:355:SER:HB2	1:A:430:LYS:HE3	1.92	0.52
1:A:559:ILE:HA	1:A:624:PRO:HB3	1.92	0.52
1:A:509:LEU:HD22	1:A:622:THR:HG23	1.92	0.52
1:A:555:PRO:HA	1:A:627:LEU:HD13	1.92	0.51
1:A:532:LYS:HB2	1:A:692:ARG:HG2	1.93	0.51
1:A:58:ARG:HD3	1:A:90:LEU:HD23	1.91	0.51
1:A:88:MET:HE3	1:A:516:ILE:HD12	1.92	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:303:ASN:OD1	3:C:165:ASN:ND2	2.44	0.50
2:B:304:ASN:HA	2:B:364:PRO:HG3	1.91	0.50
4:G:156:ILE:HG12	4:G:159:ARG:HH21	1.76	0.50
1:A:335:ILE:HD13	1:A:349:ILE:HG21	1.94	0.49
1:A:660:TYR:HA	1:A:663:VAL:HG12	1.94	0.49
1:A:873:GLU:OE1	1:A:995:ARG:NH2	2.45	0.49
2:B:23:SER:HB3	2:B:27:ALA:HB3	1.94	0.49
4:D:194:THR:HA	4:D:197:LYS:HB2	1.95	0.49
1:A:389:LEU:HD21	1:A:417:VAL:HB	1.94	0.49
1:A:603:PRO:HB3	1:A:608:LEU:HB2	1.95	0.48
1:A:927:ARG:NH2	5:H:32:DT:OP1	2.39	0.48
1:A:76:LEU:O	1:A:590:LYS:NZ	2.46	0.48
1:A:562:ASN:ND2	1:A:616:ASP:O	2.44	0.48
1:A:497:ARG:NH1	6:I:13:DA:OP1	2.47	0.47
1:A:823:ARG:NH1	1:A:825:ASN:OD1	2.47	0.47
2:B:376:ARG:HD3	2:B:376:ARG:HA	1.71	0.47
6:I:13:DA:H2'	6:I:14:DG:H8	1.78	0.47
1:A:72:ILE:HD12	1:A:573:VAL:HG21	1.96	0.47
6:I:13:DA:H2'	6:I:14:DG:C8	2.49	0.47
4:F:179:PHE:HA	4:F:182:MET:HE2	1.96	0.47
1:A:62:LYS:HG2	1:A:85:VAL:HG12	1.96	0.46
1:A:502:ILE:HG23	1:A:626:LEU:HD21	1.97	0.46
1:A:586:LEU:O	1:A:590:LYS:HB3	2.15	0.46
4:D:170:VAL:HG21	4:G:141:ASP:HB3	1.98	0.46
3:C:154:VAL:HA	3:C:175:THR:HB	1.97	0.46
1:A:486:TYR:CG	1:A:501:ILE:HB	2.51	0.46
1:A:117:ASN:HA	1:A:146:ARG:HD3	1.97	0.46
1:A:693:ARG:HE	1:A:696:LEU:HD12	1.80	0.46
1:A:900:TYR:OH	5:H:31:DA:OP1	2.30	0.46
1:A:746:ARG:NH2	1:A:758:GLU:OE1	2.48	0.46
4:F:182:MET:SD	4:F:182:MET:N	2.89	0.45
1:A:344:TYR:HA	1:A:349:ILE:HD11	1.98	0.45
1:A:392:GLY:HA3	1:A:433:PHE:HE2	1.81	0.45
1:A:634:ARG:HE	1:A:661:LYS:HB2	1.81	0.45
1:A:692:ARG:HA	1:A:695:ILE:HD12	1.99	0.45
3:C:6:ILE:HG22	3:C:27:VAL:HG13	1.99	0.45
3:C:185:ARG:HD3	6:I:7:DG:C4	2.51	0.45
1:A:634:ARG:NE	1:A:661:LYS:HB2	2.32	0.45
2:B:397:ASN:HB3	2:B:400:ILE:HB	1.98	0.45
1:A:267:PHE:O	1:A:271:TYR:HB2	2.17	0.45
2:B:262:THR:HG22	4:E:162:ALA:HA	1.98	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:124:SER:HB3	3:C:137:TRP:HE1	1.82	0.45
4:D:163:VAL:HA	4:D:166:VAL:HG12	1.99	0.45
1:A:76:LEU:HD23	1:A:590:LYS:HD3	1.98	0.45
1:A:265:HIS:HD2	1:A:269:LEU:HD12	1.82	0.45
4:D:182:MET:HE1	4:E:146:THR:HG21	1.98	0.45
4:G:190:SER:HA	4:G:193:VAL:HG22	1.99	0.45
1:A:58:ARG:NH2	1:A:116:SER:O	2.50	0.44
2:B:143:SER:OG	2:B:146:GLN:O	2.34	0.44
3:C:61:ARG:NE	3:C:208:THR:O	2.49	0.44
1:A:550:TYR:HB2	1:A:753:ASP:HB2	1.99	0.44
1:A:8:TRP:CE2	1:A:20:LEU:HD13	2.53	0.44
1:A:196:LYS:NZ	1:A:233:GLU:OE2	2.43	0.44
1:A:583:ASN:O	1:A:587:LEU:HB2	2.18	0.44
1:A:63:MET:HB2	1:A:88:MET:HG3	2.00	0.44
1:A:144:ASP:OD2	1:A:147:ASN:ND2	2.48	0.44
1:A:162:TYR:HB2	1:A:191:ILE:HB	2.00	0.44
1:A:627:LEU:HA	1:A:627:LEU:HD23	1.80	0.44
4:D:160:ILE:HG21	4:E:182:MET:HE1	2.00	0.44
1:A:725:ASP:OD1	1:A:725:ASP:N	2.50	0.43
1:A:760:ASP:N	1:A:760:ASP:OD1	2.48	0.43
1:A:575:THR:HA	1:A:608:LEU:HA	2.01	0.43
2:B:2:THR:OG1	3:C:194:SER:OG	2.32	0.43
4:F:154:LYS:HG3	6:I:39:DC:H3'	2.00	0.43
1:A:163:LEU:HB3	1:A:259:VAL:HG22	2.01	0.43
1:A:536:PRO:HG3	1:A:800:MET:HE2	2.00	0.43
4:G:154:LYS:HA	4:G:154:LYS:HD3	1.82	0.43
1:A:115:ILE:HG22	1:A:511:LEU:HD12	2.01	0.42
1:A:736:SER:OG	1:A:773:GLU:OE1	2.36	0.42
1:A:895:MET:HE2	1:A:895:MET:HB3	1.91	0.42
1:A:304:GLN:HB2	1:A:315:ASN:HB3	2.01	0.42
4:F:186:ILE:HD12	4:G:189:LEU:HD22	2.00	0.42
3:C:8:HIS:CE1	3:C:34:ALA:HB3	2.55	0.42
2:B:371:LEU:HB2	2:B:400:ILE:HG23	2.02	0.42
4:F:186:ILE:HA	4:F:189:LEU:HG	2.00	0.42
2:B:195:ILE:HG22	2:B:274:ILE:HG13	2.02	0.42
2:B:363:TYR:CZ	2:B:403:ILE:HG23	2.55	0.42
3:C:137:TRP:O	3:C:141:SER:OG	2.33	0.42
4:D:167:LEU:HA	4:D:170:VAL:HG12	2.02	0.42
1:A:306:SER:HB2	1:A:314:ALA:HB2	2.01	0.42
1:A:426:ASN:HB2	1:A:429:TYR:CZ	2.55	0.42
1:A:829:SER:HB3	1:A:835:VAL:HG11	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:277:GLU:OE1	1:A:283:LYS:NZ	2.46	0.41
1:A:582:ILE:HG13	2:B:379:ILE:HD13	2.02	0.41
1:A:901:LYS:NZ	5:H:29:DG:OP1	2.43	0.41
1:A:488:LEU:HD11	1:A:500:THR:HG22	2.02	0.41
1:A:2:ASP:OD1	1:A:126:SER:OG	2.30	0.41
1:A:602:GLU:O	1:A:685:LYS:NZ	2.40	0.41
2:B:378:LYS:HB2	2:B:386:ASN:HB3	2.03	0.41
1:A:273:THR:HG21	1:A:297:LEU:HD22	2.02	0.41
2:B:44:LYS:HE2	3:C:174:VAL:HA	2.03	0.41
1:A:179:PHE:O	3:C:36:TRP:NE1	2.39	0.41
4:G:151:LYS:HE3	4:G:151:LYS:HB3	1.86	0.41
1:A:730:ASN:HD21	1:A:732:ILE:HB	1.87	0.40
2:B:155:ALA:HB1	2:B:160:LEU:HD12	2.03	0.40
2:B:186:ARG:HH11	2:B:186:ARG:HD3	1.77	0.40
3:C:88:SER:HA	3:C:182:PRO:HB2	2.02	0.40
1:A:749:TYR:HB3	1:A:756:PHE:HB2	2.03	0.40
2:B:87:PHE:O	2:B:129:PHE:N	2.51	0.40
2:B:335:VAL:O	2:B:339:ASN:ND2	2.55	0.40
3:C:126:LYS:H	3:C:132:SER:HG	1.67	0.40
1:A:33:ARG:NH1	1:A:290:ASP:OD2	2.51	0.40
2:B:78:PHE:CD2	2:B:184:MET:HE3	2.57	0.40
2:B:93:LYS:HE3	2:B:115:ASN:HD22	1.86	0.40
2:B:250:VAL:HG21	2:B:303:VAL:HG13	2.03	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	A	1004/1006 (100%)	968 (96%)	35 (4%)	1 (0%)	48 73
2	B	424/426 (100%)	418 (99%)	6 (1%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	C	216/218 (99%)	209 (97%)	6 (3%)	1 (0%)	24	48
4	D	67/210 (32%)	63 (94%)	4 (6%)	0	100	100
4	E	55/210 (26%)	55 (100%)	0	0	100	100
4	F	63/210 (30%)	62 (98%)	1 (2%)	0	100	100
4	G	55/210 (26%)	53 (96%)	2 (4%)	0	100	100
All	All	1884/2490 (76%)	1828 (97%)	54 (3%)	2 (0%)	49	73

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	51	SER
3	C	9	ALA

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	928/928 (100%)	928 (100%)	0	100	100
2	B	396/396 (100%)	396 (100%)	0	100	100
3	C	200/200 (100%)	200 (100%)	0	100	100
4	D	62/188 (33%)	62 (100%)	0	100	100
4	E	50/188 (27%)	50 (100%)	0	100	100
4	F	56/188 (30%)	56 (100%)	0	100	100
4	G	50/188 (27%)	50 (100%)	0	100	100
All	All	1742/2276 (76%)	1742 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

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

Mol	Chain	Res	Type
1	A	204	ASN
1	A	543	ASN
1	A	703	ASN
1	A	730	ASN
1	A	862	ASN
1	A	905	ASN
2	B	94	ASN
2	B	115	ASN
2	B	133	ASN
2	B	270	ASN
2	B	304	ASN
3	C	52	GLN
3	C	111	ASN
3	C	165	ASN
3	C	187	HIS
3	C	214	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 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 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
7	D3T	A	2001	8	28,29,29	1.26	5 (17%)	39,45,45	2.03	10 (25%)

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
7	D3T	A	2001	8	-	6/22/31/31	0/2/2/2

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	2001	D3T	C4-N3	-2.85	1.33	1.38
7	A	2001	D3T	C6-C5	2.53	1.38	1.34
7	A	2001	D3T	C6-N1	-2.34	1.34	1.38
7	A	2001	D3T	C4-C5	2.32	1.48	1.44
7	A	2001	D3T	C2-N3	-2.30	1.34	1.38

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	2001	D3T	C4-N3-C2	-5.20	120.52	127.34
7	A	2001	D3T	N3-C2-N1	4.92	121.30	114.89
7	A	2001	D3T	C5-C4-N3	4.65	119.36	115.32
7	A	2001	D3T	C5-C6-N1	-3.85	119.14	123.31
7	A	2001	D3T	O4-C4-C5	-3.47	120.95	124.92
7	A	2001	D3T	C3'-C2'-C1'	3.34	106.71	102.87
7	A	2001	D3T	O2-C2-N1	-2.76	119.20	122.80
7	A	2001	D3T	C2'-C1'-N1	-2.53	107.61	112.40
7	A	2001	D3T	C5M-C5-C4	2.33	121.27	118.78
7	A	2001	D3T	O2B-PB-O3B	2.31	113.53	107.27

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	A	2001	D3T	C5'-O5'-PA-O1A
7	A	2001	D3T	C5'-O5'-PA-O3A
7	A	2001	D3T	PB-O3A-PA-O5'
7	A	2001	D3T	C5'-O5'-PA-O2A

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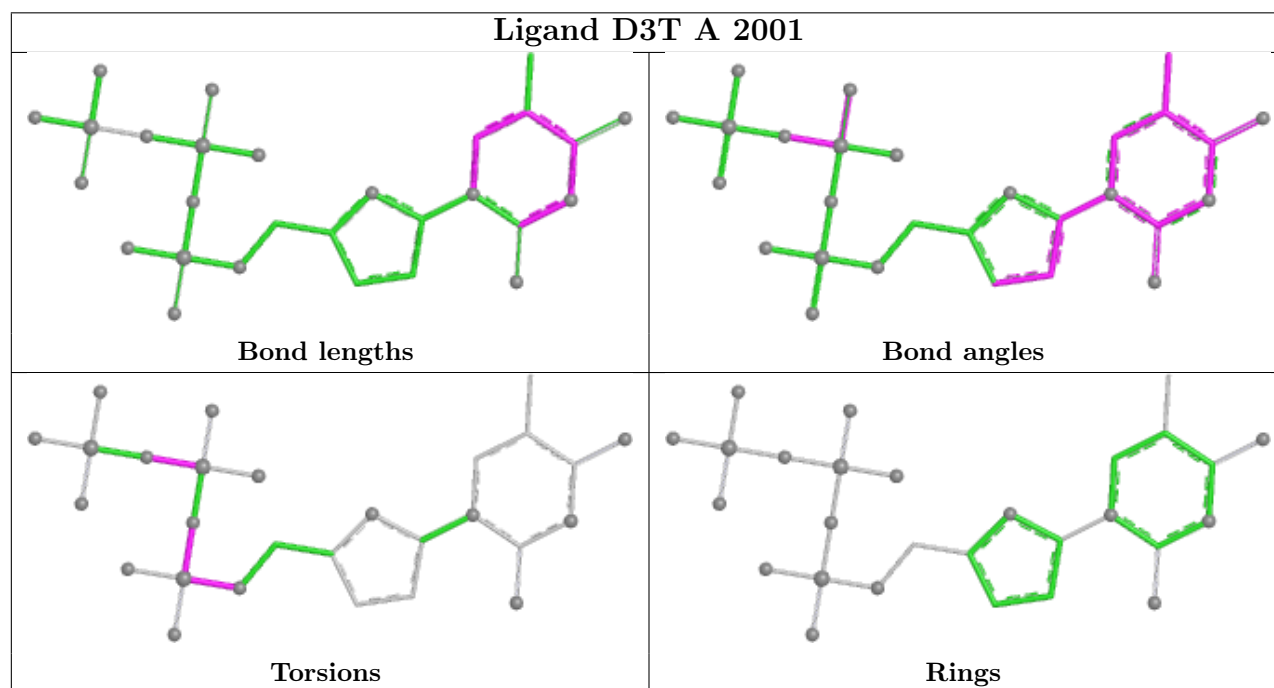
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Mol	Chain	Res	Type	Atoms
7	A	2001	D3T	PG-O3B-PB-O2B
7	A	2001	D3T	PG-O3B-PB-O1B

There are no ring outliers.

No monomer is involved in short contacts.

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



5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

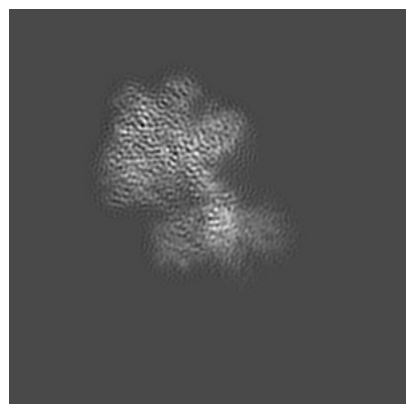
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-37714. These allow visual inspection of the internal detail of the map and identification of artifacts.

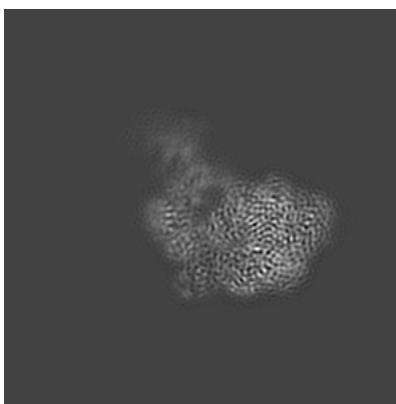
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

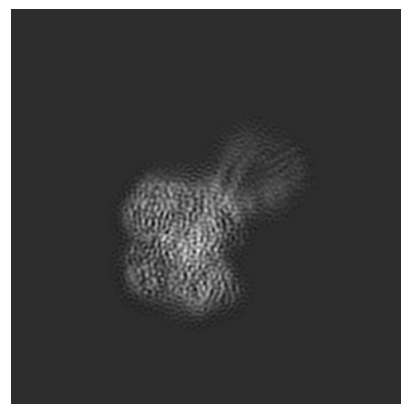
6.1.1 Primary map



X

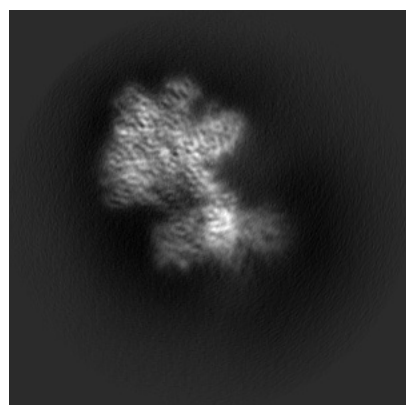


Y

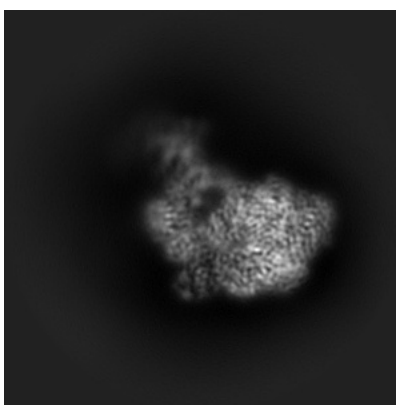


Z

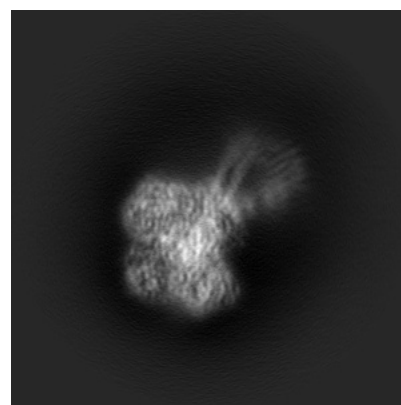
6.1.2 Raw map



X



Y

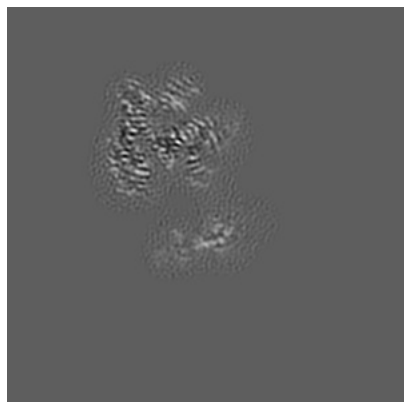


Z

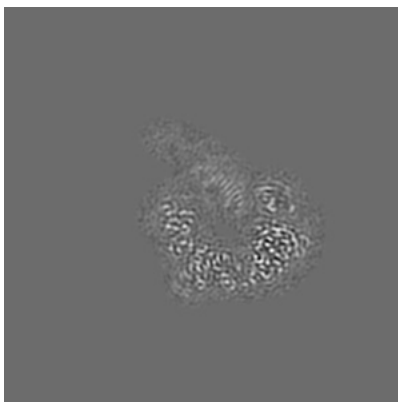
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

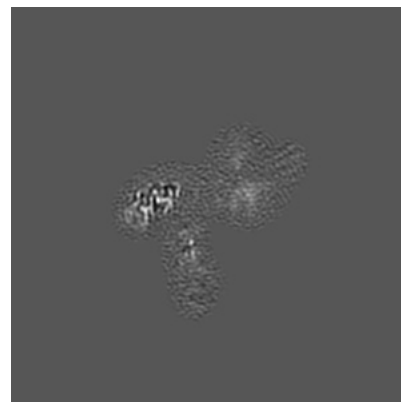
6.2.1 Primary map



X Index: 150

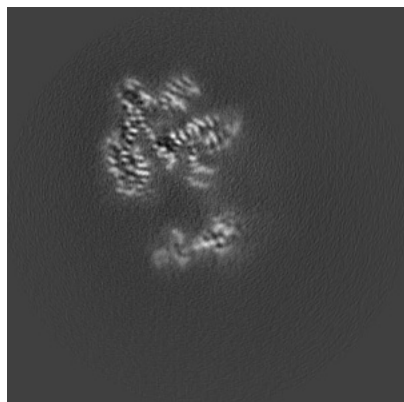


Y Index: 150

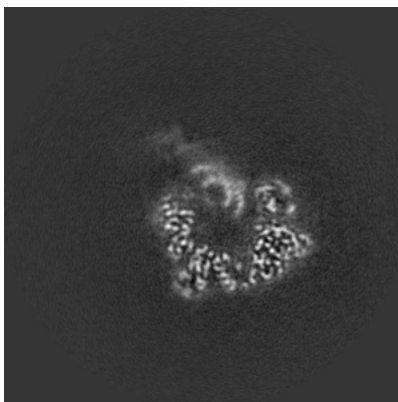


Z Index: 150

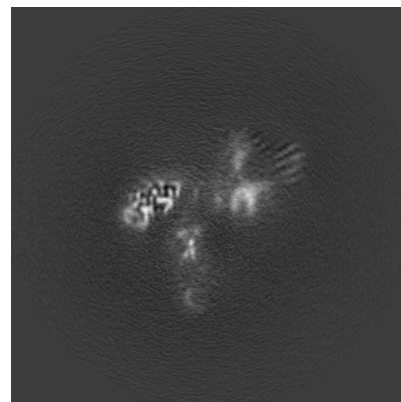
6.2.2 Raw map



X Index: 150



Y Index: 150



Z Index: 150

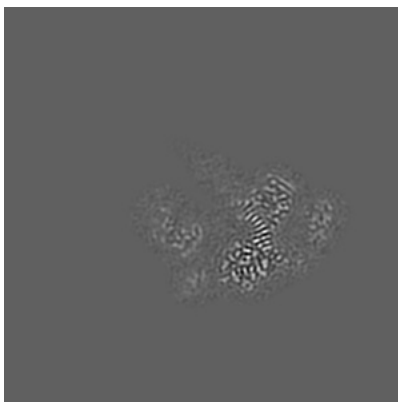
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

6.3.1 Primary map



X Index: 140

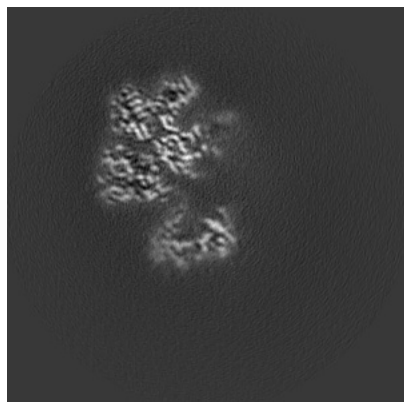


Y Index: 136

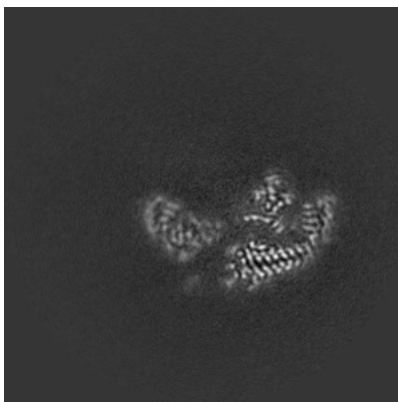


Z Index: 190

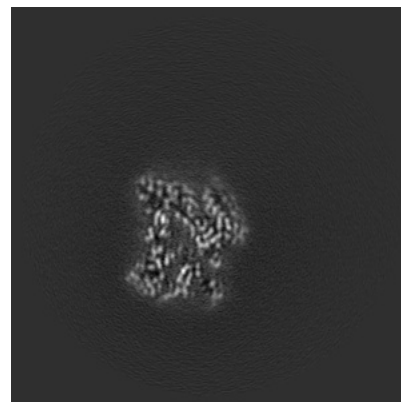
6.3.2 Raw map



X Index: 140



Y Index: 129

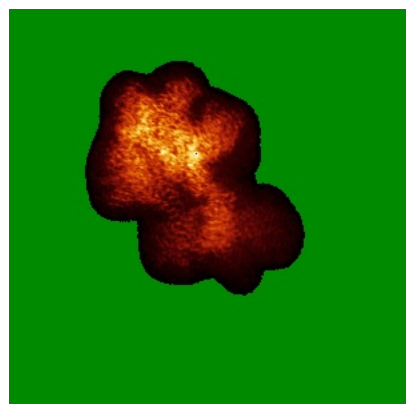


Z Index: 202

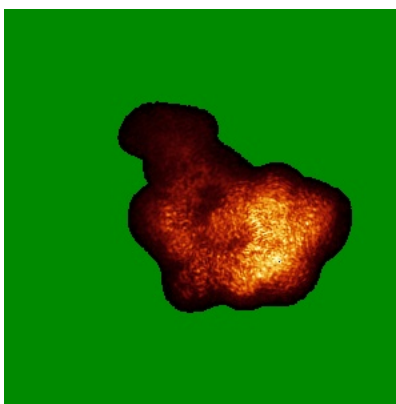
The images above show the largest variance slices of the map in three orthogonal directions.

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

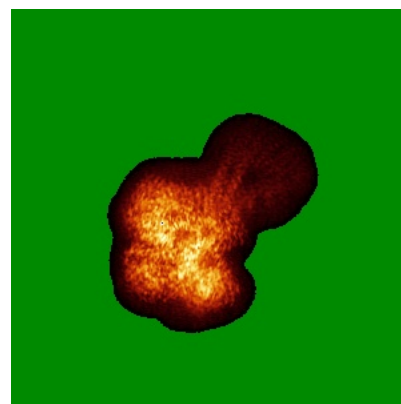
6.4.1 Primary map



X

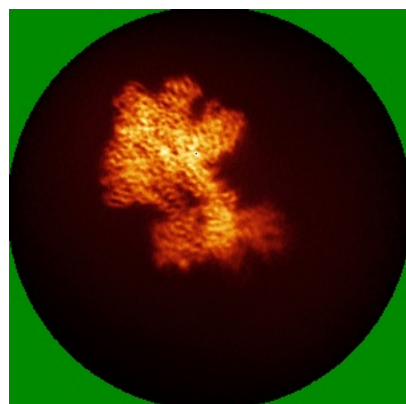


Y

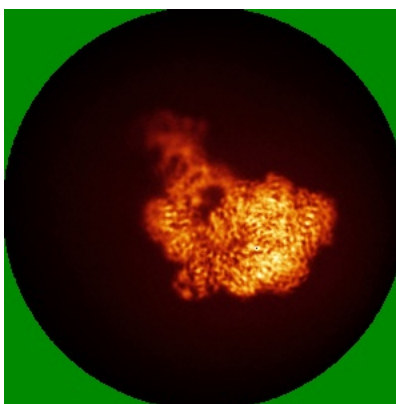


Z

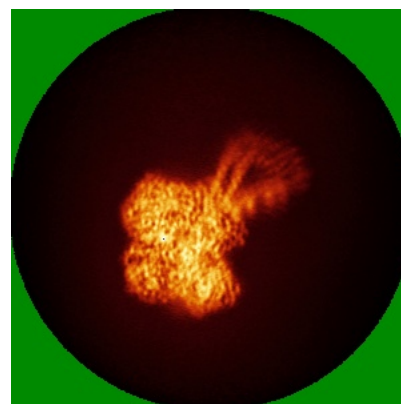
6.4.2 Raw map



X



Y

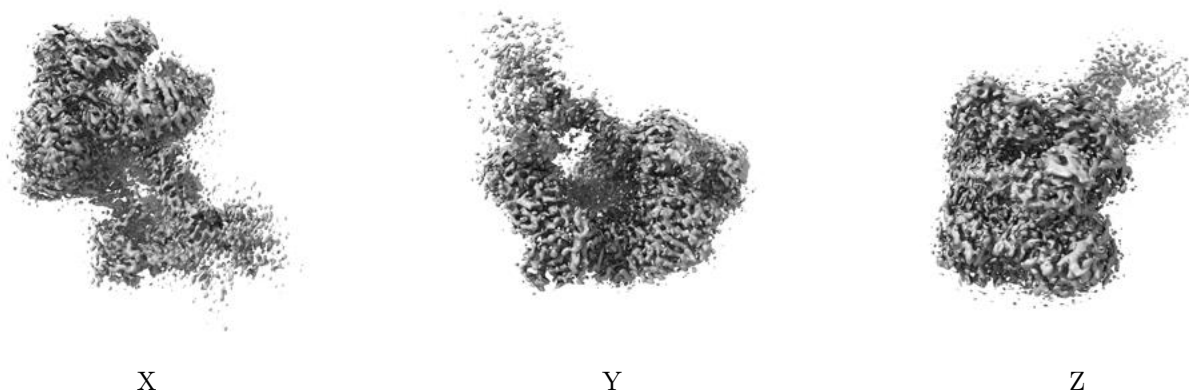


Z

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.

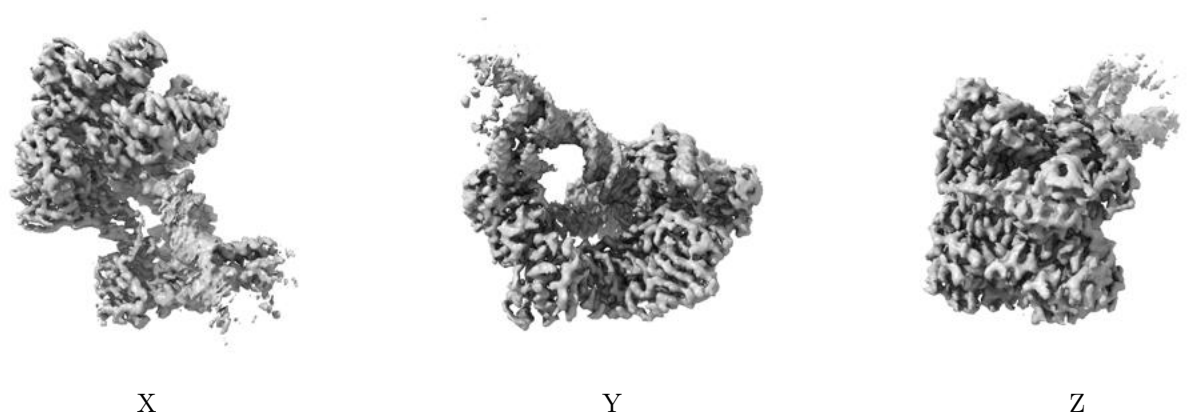
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.016. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



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

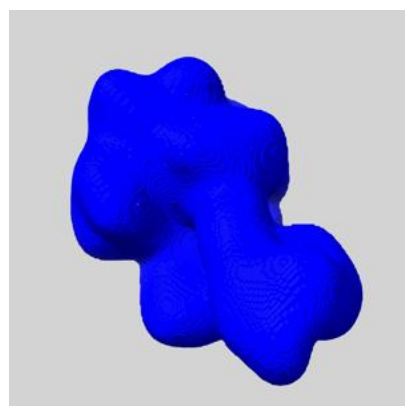
6.6 Mask visualisation [i](#)

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

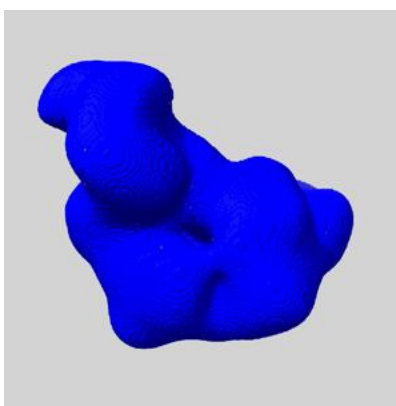
A mask typically either:

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

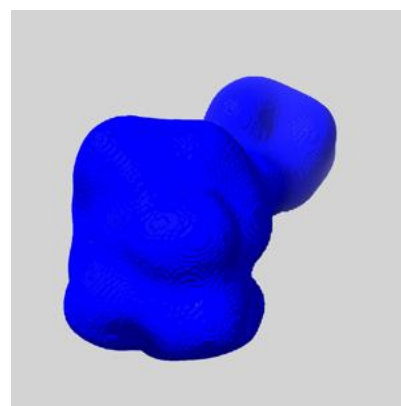
6.6.1 emd_37714_msk_1.map [i](#)



X



Y

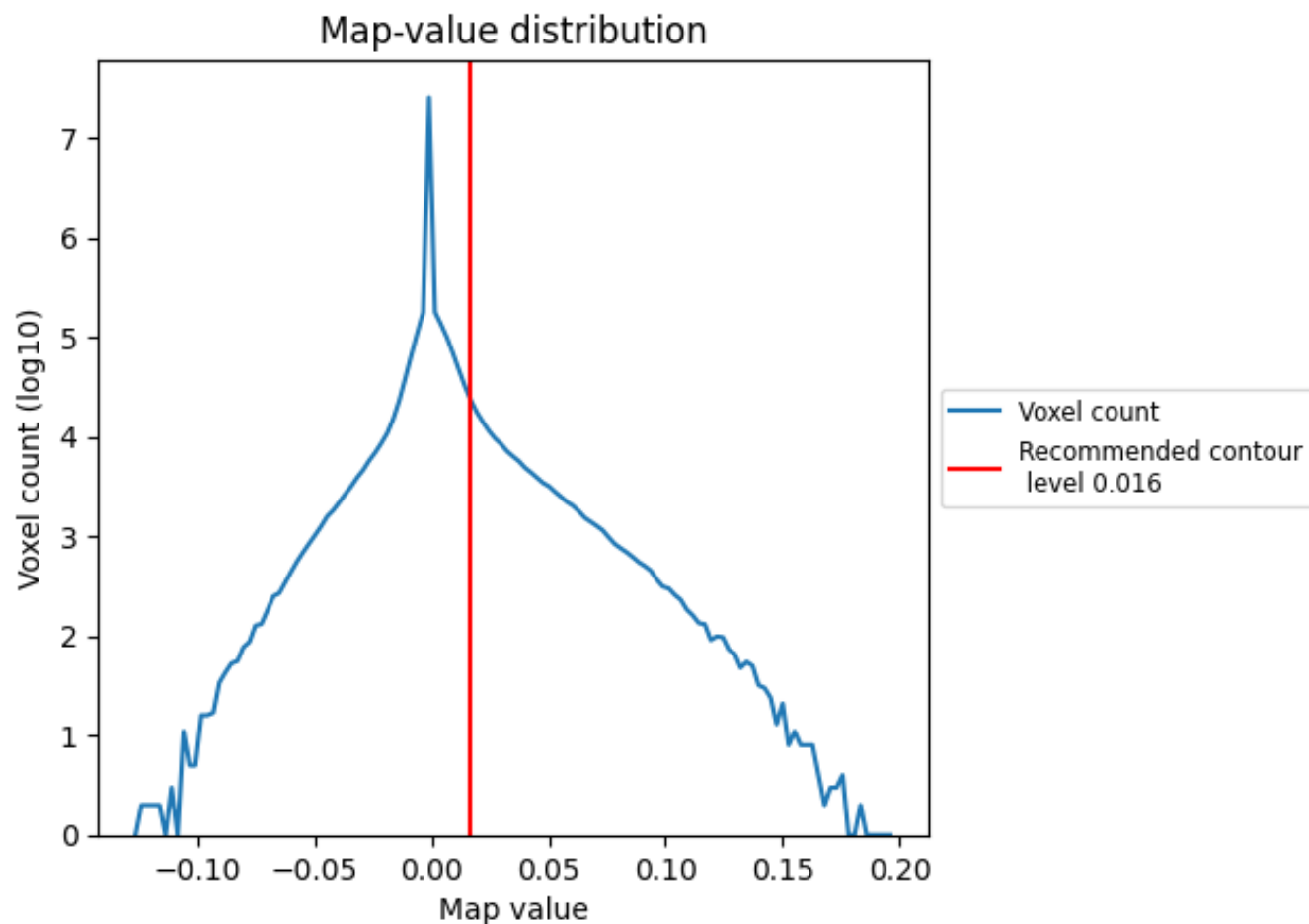


Z

7 Map analysis [i](#)

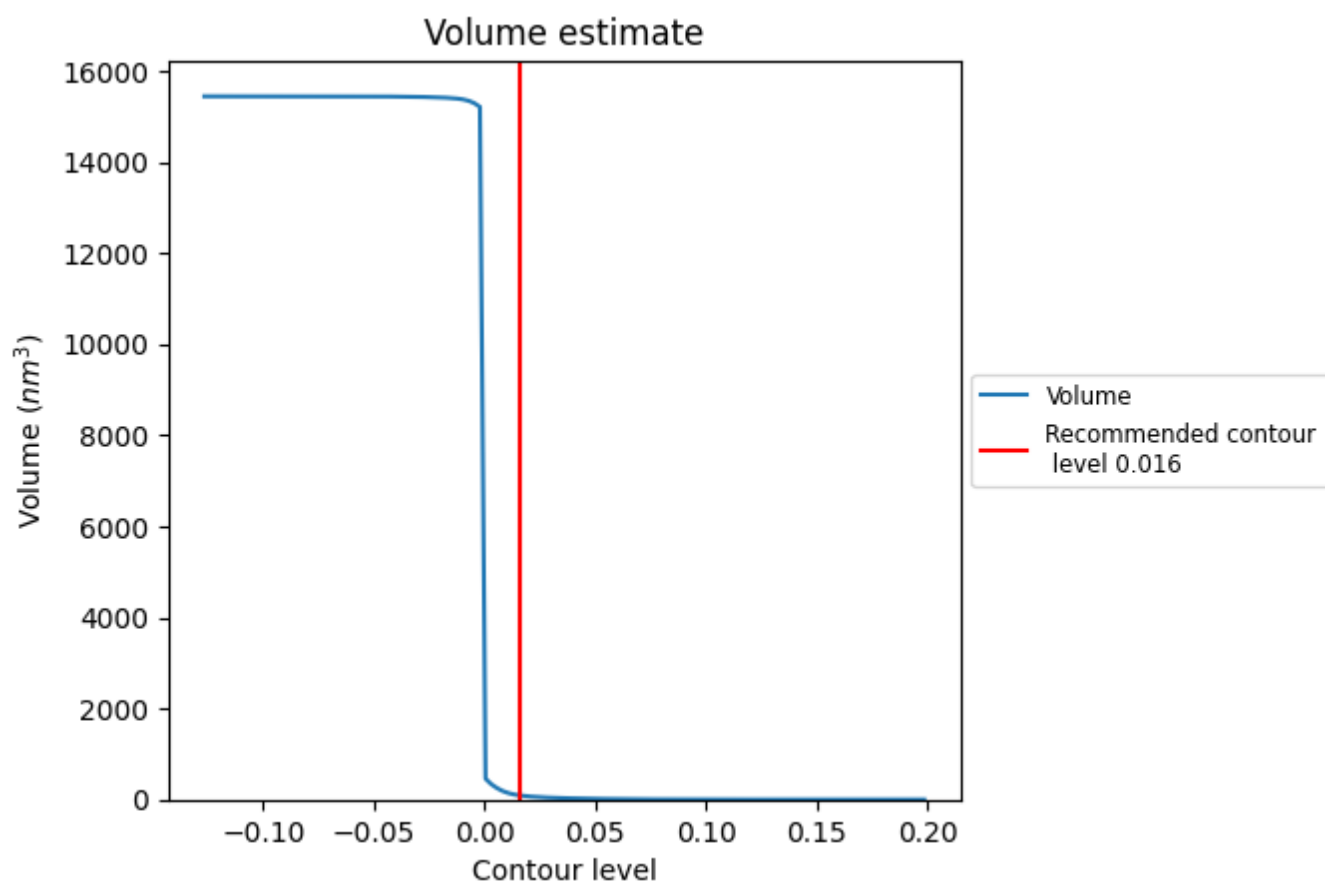
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

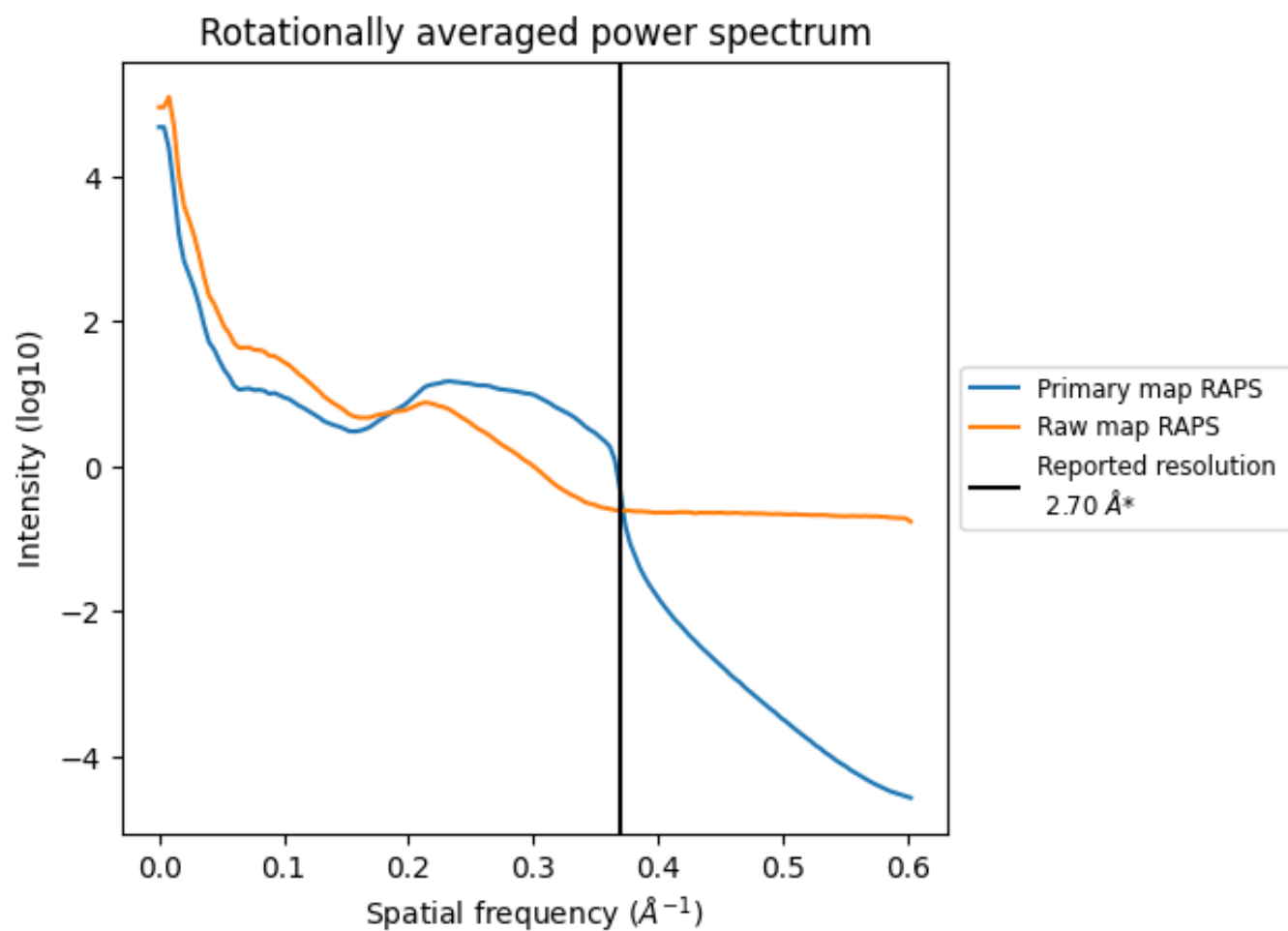
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 91 nm³; this corresponds to an approximate mass of 82 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 ⓘ

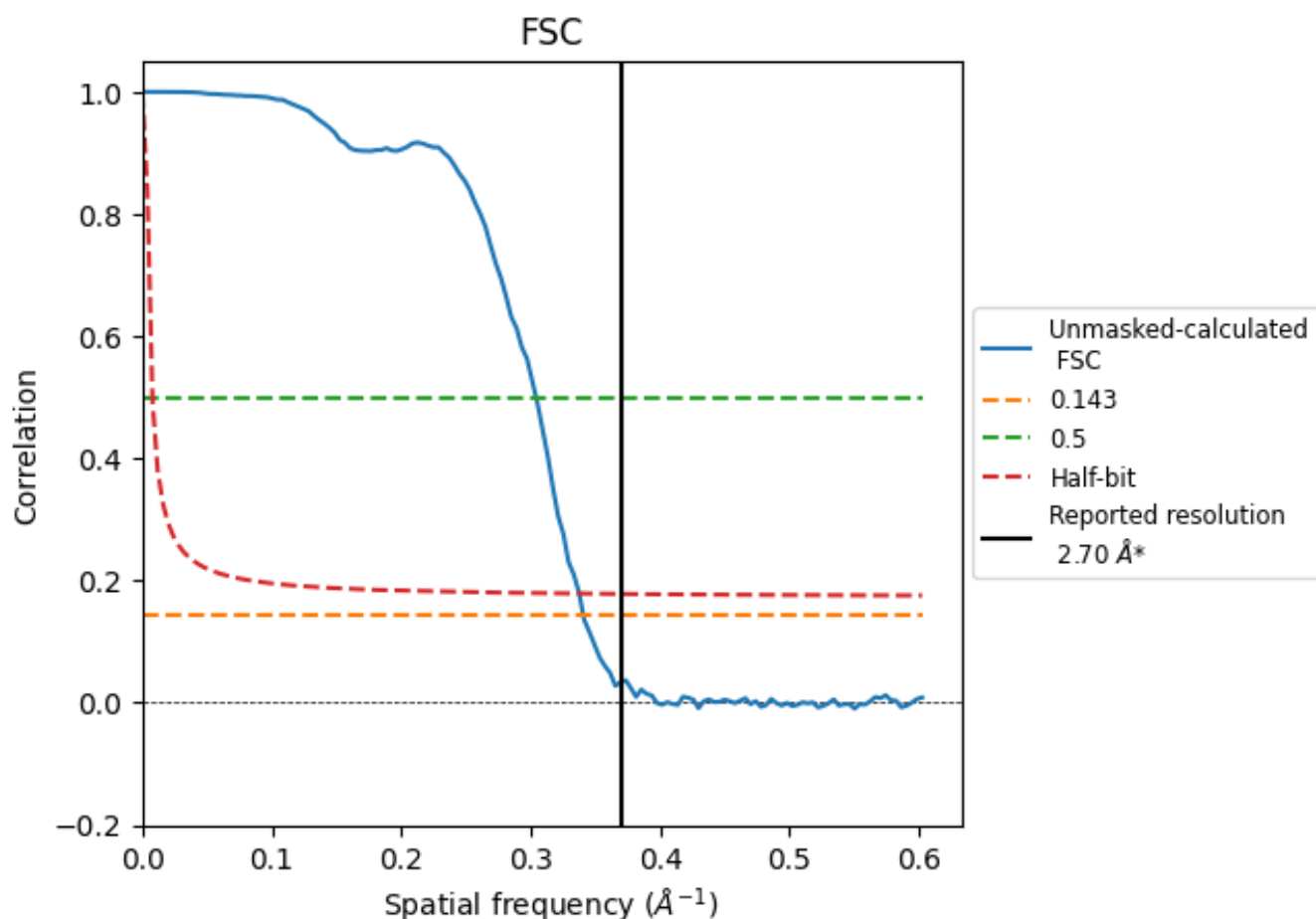


*Reported resolution corresponds to spatial frequency of 0.370 $\text{\AA}^{-1}$

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 0.370 Å⁻¹

8.2 Resolution estimates [i](#)

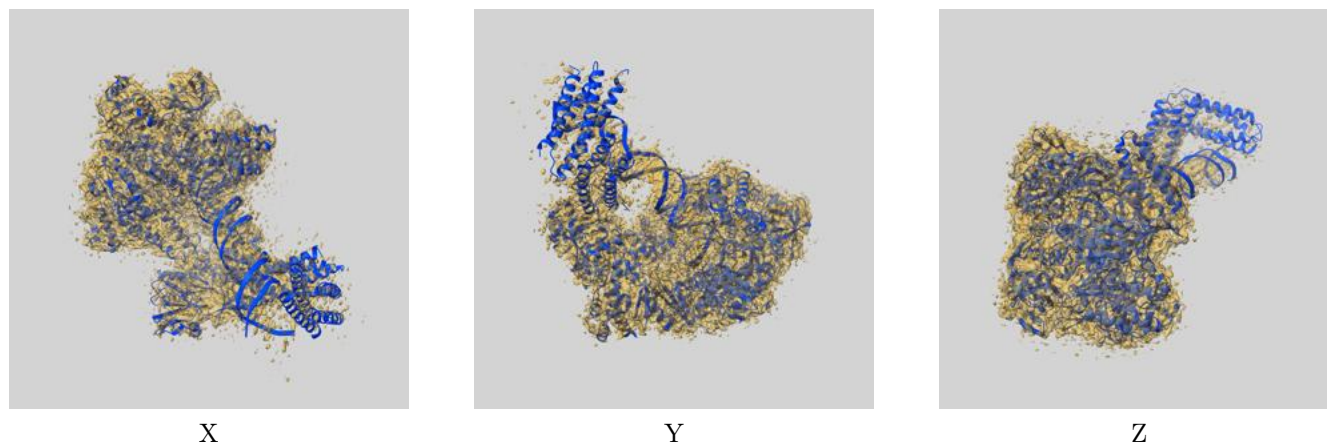
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.70	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	2.94	3.29	2.96

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

9 Map-model fit [i](#)

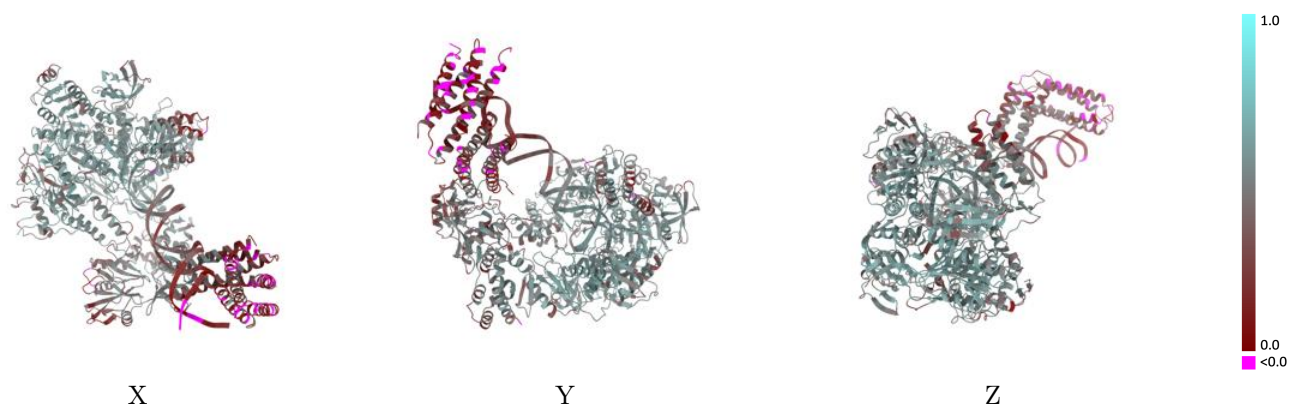
This section contains information regarding the fit between EMDB map EMD-37714 and PDB model 8WPE. Per-residue inclusion information can be found in [section 3](#) on [page 6](#).

9.1 Map-model overlay [i](#)



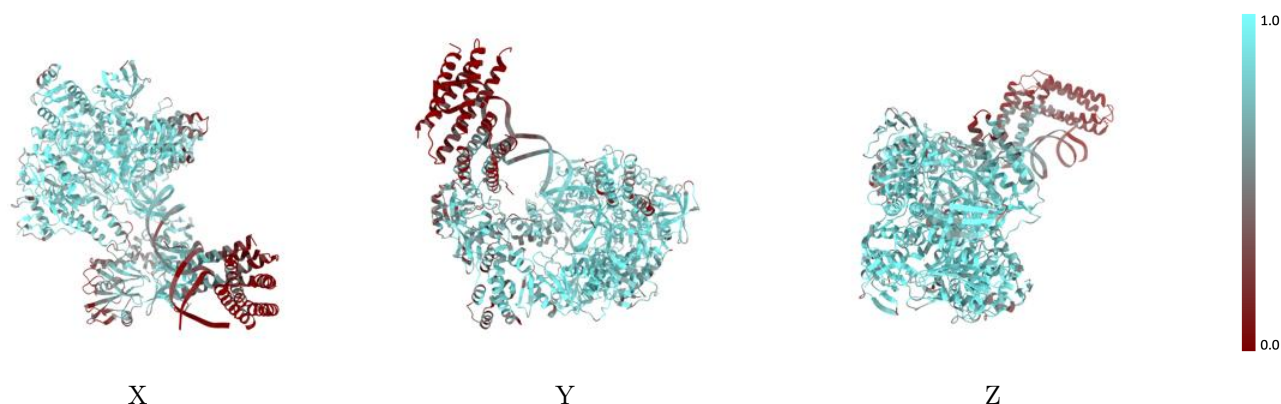
The images above show the 3D surface view of the map at the recommended contour level 0.016 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



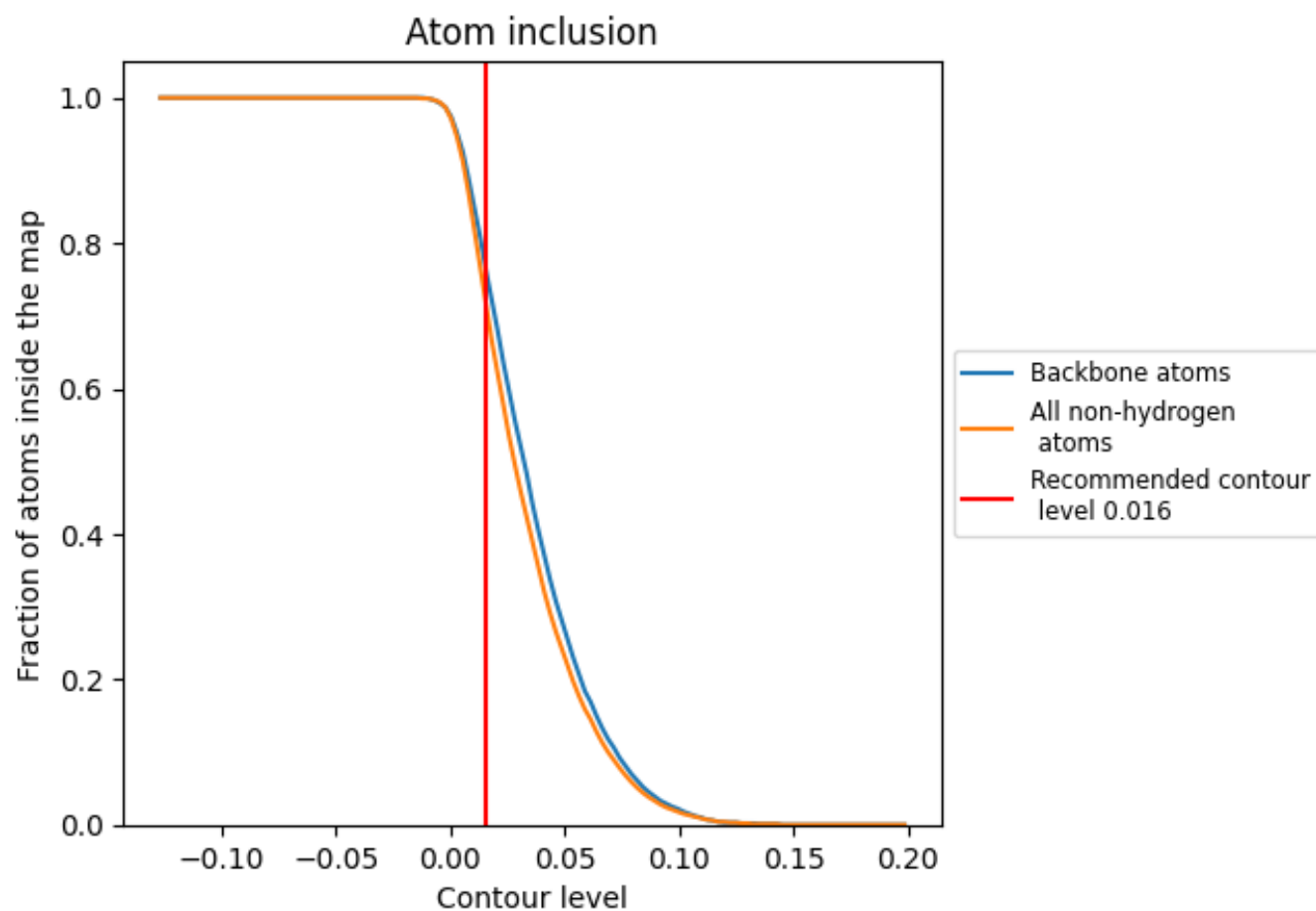
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

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



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.016).

9.4 Atom inclusion [i](#)



At the recommended contour level, 76% of all backbone atoms, 71% 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 (0.016) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7120	0.4700
A	0.8400	0.5430
B	0.6390	0.4380
C	0.8260	0.5290
D	0.3830	0.2500
E	0.5080	0.3510
F	0.0940	0.1520
G	0.0550	0.1370
H	0.5690	0.3700
I	0.6290	0.3750

1.0

0.0

<0.0