WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB EM Validation Report ⓘ

Aug 4, 2025 – 03:17 PM EDT

PDB ID	:	9D2B / pdb_00009d2b
EMDB ID	:	EMD-46489
Title	:	Symmetry-expanded reconstruction of augmin T-II bonsai on the microtubule
Authors	:	Travis, S.M.; Zhang, R.
Deposited on	:	2024-08-08
Resolution	:	3.08 Å(reported)
Based on initial models	:	8FCK, 6DPU

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:
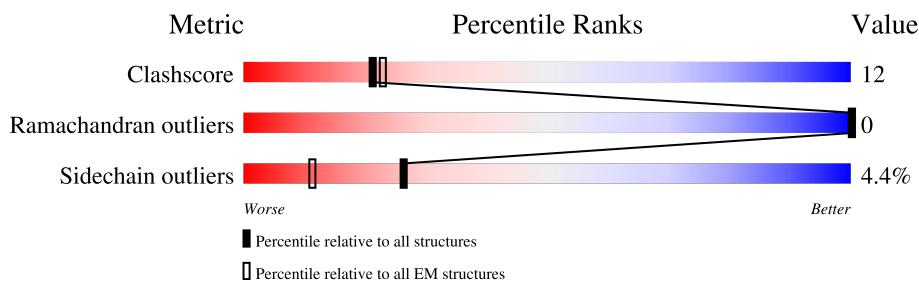
|		
EMDB validation analysis	:	0.0.1.dev126
Mogul	:	2022.3.0, CSD as543be (2022)
MolProbity	:	4-5-2 with Phenix2.0rc1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.45.1

1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY
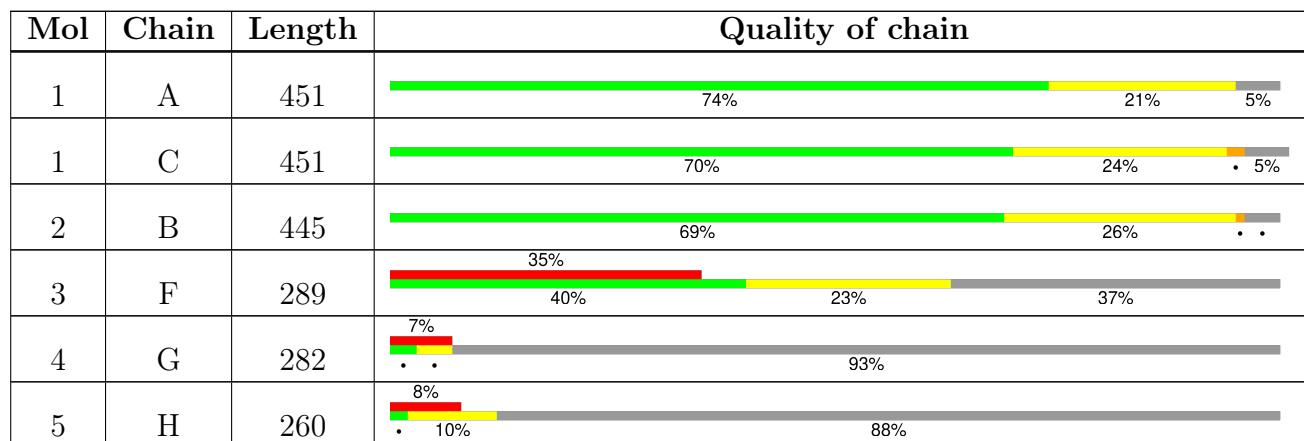
The reported resolution of this entry is 3.08 Å.

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	Percentile Ranks	Value
Clashscore		12
Ramachandran outliers		0
Sidechain outliers		4.4%

Worse *Better*

▉ Percentile relative to all structures

▯ Percentile relative to all EM structures

Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

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	451	74% 21% 5%
1	C	451	70% 24% • 5%
2	B	445	69% 26% • •
3	F	289	35% / 40% 23% 37%
4	G	282	7% / • • 93%
5	H	260	8% / • 10% 88%

2 Entry composition ⓘ

There are 8 unique types of molecules in this entry. The entry contains 12067 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 Tubulin alpha-1B chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	C	430	Total 3356	C 2129	N 573	O 633	S 21	0	0
1	A	430	Total 3356	C 2129	N 573	O 633	S 21	0	0

- Molecule 2 is a protein called Tubulin beta-2B chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	427	Total 3358	C 2109	N 573	O 649	S 27	0	0

- Molecule 3 is a protein called HAUS augmin like complex subunit 6 L homeolog isoform X1.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	F	183	Total 1485	C 966	N 260	O 252	S 7	0	0

There are 44 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
F	-20	MET	-	expression tag	UNP A0A8J1MAE8
F	-19	GLY	-	expression tag	UNP A0A8J1MAE8
F	-18	SER	-	expression tag	UNP A0A8J1MAE8
F	-17	SER	-	expression tag	UNP A0A8J1MAE8
F	-16	HIS	-	expression tag	UNP A0A8J1MAE8
F	-15	HIS	-	expression tag	UNP A0A8J1MAE8
F	-14	HIS	-	expression tag	UNP A0A8J1MAE8
F	-13	HIS	-	expression tag	UNP A0A8J1MAE8
F	-12	HIS	-	expression tag	UNP A0A8J1MAE8
F	-11	HIS	-	expression tag	UNP A0A8J1MAE8
F	-10	SER	-	expression tag	UNP A0A8J1MAE8
F	-9	GLY	-	expression tag	UNP A0A8J1MAE8
F	-8	ARG	-	expression tag	UNP A0A8J1MAE8

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Chain	Residue	Modelled	Actual	Comment	Reference
F	-7	GLU	-	expression tag	UNP A0A8J1MAE8
F	-6	ASN	-	expression tag	UNP A0A8J1MAE8
F	-5	LEU	-	expression tag	UNP A0A8J1MAE8
F	-4	TYR	-	expression tag	UNP A0A8J1MAE8
F	-3	PHE	-	expression tag	UNP A0A8J1MAE8
F	-2	GLN	-	expression tag	UNP A0A8J1MAE8
F	-1	GLY	-	expression tag	UNP A0A8J1MAE8
F	0	SER	-	expression tag	UNP A0A8J1MAE8
F	8	HIS	GLN	conflict	UNP A0A8J1MAE8
F	70	VAL	MET	conflict	UNP A0A8J1MAE8
F	198	LEU	-	insertion	UNP A0A8J1MAE8
F	199	LEU	-	insertion	UNP A0A8J1MAE8
F	200	ILE	-	insertion	UNP A0A8J1MAE8
F	201	LYS	-	insertion	UNP A0A8J1MAE8
F	202	GLN	-	insertion	UNP A0A8J1MAE8
F	203	ILE	-	insertion	UNP A0A8J1MAE8
F	204	ARG	-	insertion	UNP A0A8J1MAE8
F	205	ASP	-	insertion	UNP A0A8J1MAE8
F	206	MET	-	insertion	UNP A0A8J1MAE8
F	207	ARG	-	insertion	UNP A0A8J1MAE8
F	208	SER	-	insertion	UNP A0A8J1MAE8
F	209	GLU	-	insertion	UNP A0A8J1MAE8
F	210	HIS	-	insertion	UNP A0A8J1MAE8
F	211	VAL	-	insertion	UNP A0A8J1MAE8
F	212	ALA	-	insertion	UNP A0A8J1MAE8
F	213	LEU	-	insertion	UNP A0A8J1MAE8
F	214	GLN	-	insertion	UNP A0A8J1MAE8
F	215	ASN	-	insertion	UNP A0A8J1MAE8
F	216	GLN	-	insertion	UNP A0A8J1MAE8
F	217	GLN	-	insertion	UNP A0A8J1MAE8
F	218	LYS	-	insertion	UNP A0A8J1MAE8

- Molecule 4 is a protein called HAUS augmin like complex subunit 7 S homeolog.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	G	19	153	97	24	31	1	0	0

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
G	-12	MET	-	expression tag	UNP B1H1T5

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Chain	Residue	Modelled	Actual	Comment	Reference
G	-11	ALA	-	expression tag	UNP B1H1T5
G	-10	ASP	-	expression tag	UNP B1H1T5
G	-9	PRO	-	expression tag	UNP B1H1T5
G	-8	TRP	-	expression tag	UNP B1H1T5
G	-7	SER	-	expression tag	UNP B1H1T5
G	-6	HIS	-	expression tag	UNP B1H1T5
G	-5	PRO	-	expression tag	UNP B1H1T5
G	-4	GLN	-	expression tag	UNP B1H1T5
G	-3	PHE	-	expression tag	UNP B1H1T5
G	-2	GLU	-	expression tag	UNP B1H1T5
G	-1	LYS	-	expression tag	UNP B1H1T5
G	0	GLY	-	expression tag	UNP B1H1T5
G	1	GLY	-	expression tag	UNP B1H1T5
G	262	TRP	-	expression tag	UNP B1H1T5
G	263	SER	-	expression tag	UNP B1H1T5
G	264	HIS	-	expression tag	UNP B1H1T5
G	265	PRO	-	expression tag	UNP B1H1T5
G	266	GLN	-	expression tag	UNP B1H1T5
G	267	PHE	-	expression tag	UNP B1H1T5
G	268	GLU	-	expression tag	UNP B1H1T5
G	269	LYS	-	expression tag	UNP B1H1T5
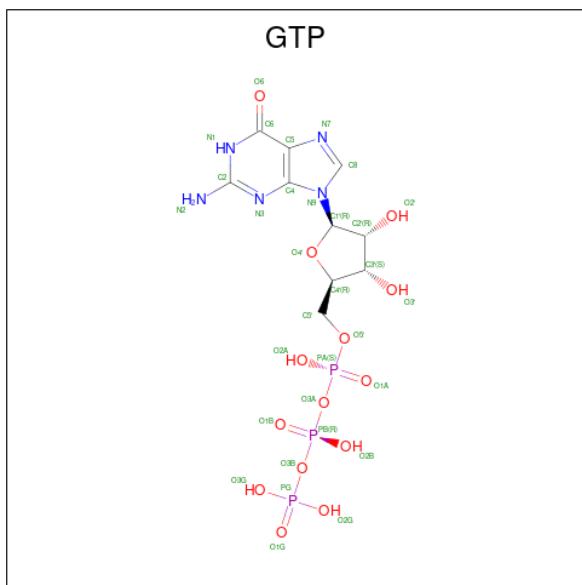
- Molecule 5 is a protein called HAUS augmin-like complex subunit 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	H	31	260	167	39	51	3	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
H	-2	MET	-	expression tag	UNP Q0IHJ3
H	-1	ARG	-	expression tag	UNP Q0IHJ3
H	0	SER	-	expression tag	UNP Q0IHJ3

- Molecule 6 is GUANOSINE-5'-TRIPHOSPHATE (CCD ID: GTP) (formula: $C_{10}H_{16}N_5O_{14}P_3$).

GTP
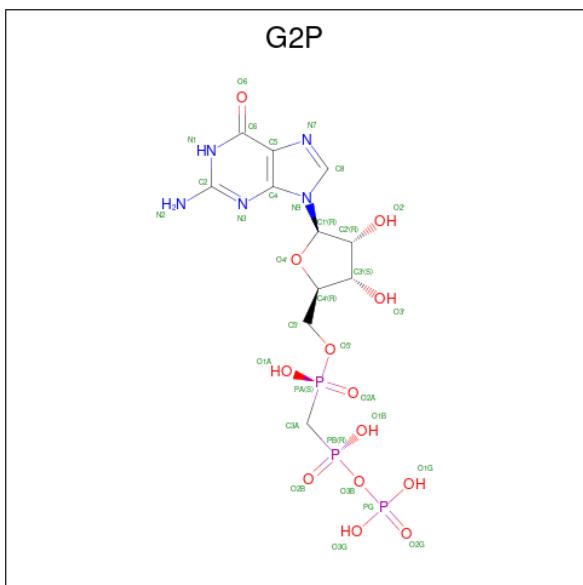
Mol	Chain	Residues	Atoms					AltConf
6	C	1	Total	C	N	O	P	0
			32	10	5	14	3	
6	A	1	Total	C	N	O	P	0
			32	10	5	14	3	

- Molecule 7 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
7	C	1	Total	Mg	0
			1	1	
7	B	1	Total	Mg	0
			1	1	
7	A	1	Total	Mg	0
			1	1	

- Molecule 8 is PHOSPHOMETHYLPHOSPHONIC ACID GUANYLATE ESTER (CCD ID: G2P) (formula: $C_{11}H_{18}N_5O_{13}P_3$).

G2P
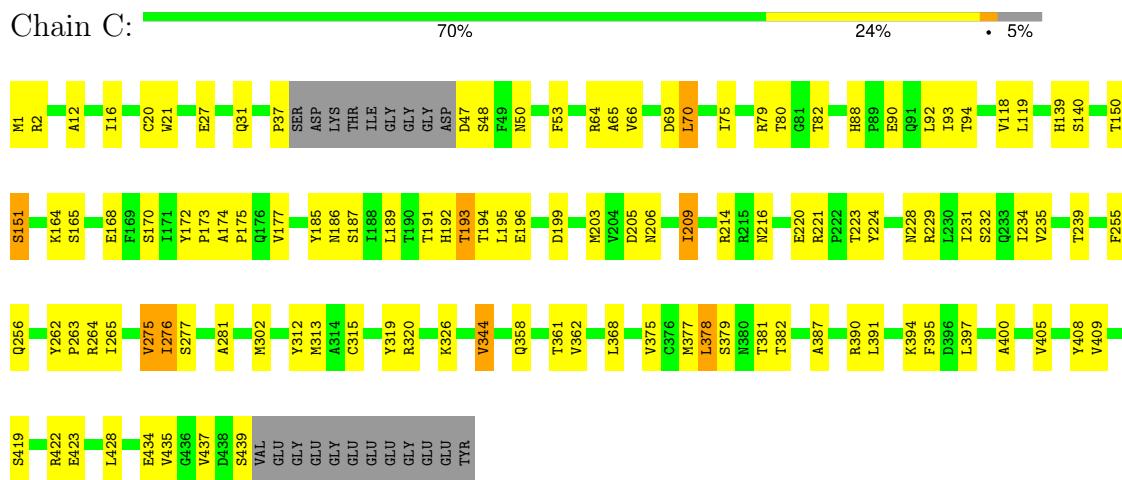
Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
8	B	1	32	11	5	13	3	0
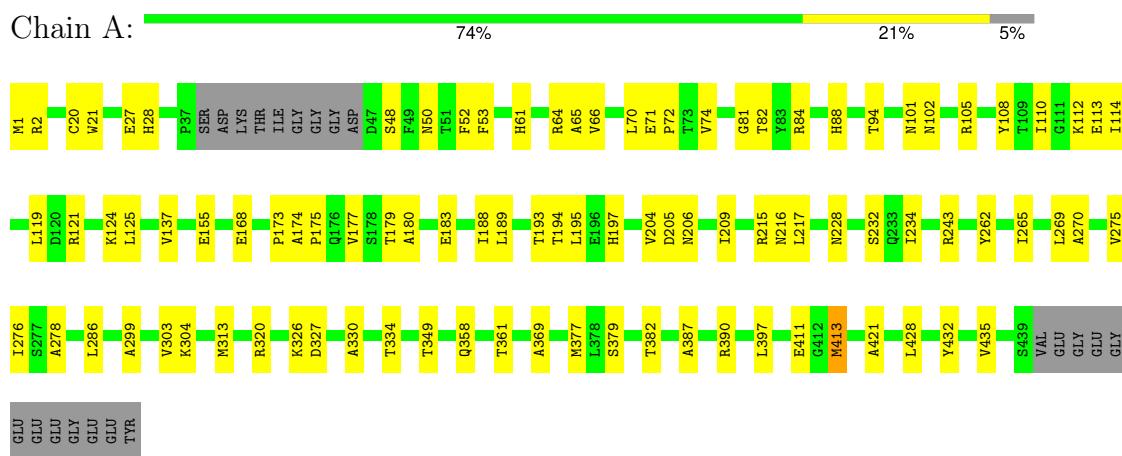
3 Residue-property plots (i)

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: Tubulin alpha-1B chain

Chain C:

• Molecule 1: Tubulin alpha-1B chain

Chain A:

• Molecule 2: Tubulin beta-2B chain

Chain B:

M1 G10 Q11 C12 G13 N14 F20 W21 I24 G38 Q43 L44 N48 V49 Y50 Y51 Y59 V60 P61 R62 A63 I64 L65 V66 D67 L68 M73 F81 I84 F92 Y106 V116 L117 V120 R121 K122 E123 S124 E125 Q131 L135 T136 H137 S138

L139 G140 G141 G142 T143 G144 S145 G146 M147 I152 S153 K154 I155 M164 N165 T166 F167 S168 S172 P173 K174 V175 T178 E181 L192 T196 D197 E198 T199 Y200 N204 E205 A206 D209 I210 C211 F212 R213 T214 L215 K216 L217 T218 T219 P220 L228 V229 S230 T238

R241 F242 D249 K252 V255 N256 M257 R262 F266 M267 L273 T274 S275 R276 L284 T285 V286 P287 E288 L289 T290 Q291 Q292 M293 K297 A301 A302 C303 T312 V313 F317 R318 M321 Q329 W344 I345 P346 N347 K350 I356 K362

Q375 E376 L377 R380 F385 R391 T399 M403 M406 E410 A411 E412 Q423 D427 ALA THR ALA ASP GLN GLY GLU PHE GLU GLU GLU GLY GLU ASP GLU ALA

- Molecule 3: HAUS augmin like complex subunit 6 L homeolog isoform X1

Chain F:

35%

40%   23%   37%

MET GLY SER SER HIS HIS HIS HIS HIS SER GLY ARG GLU ASN LEU TYR PHE GLN GLY SER MET GLN SER GLY SER ARG PRO HIS L9 A10 W11 Q12 R13 E14 H15 M16 W17 L18 A19 L20 L23 G24 F25 E26 S27 G28 A29 E30 A31 A32 N33 A34 G35 K36 T37 L38 V39 H40

V41 T42 F43 N46 M47 F48 D49 K50 K53 D54 A55 F56 Y57 V58 V59 L63 K66 L67 D68 N69 V70 R71 C72 K73 E74 V75 F76 R77 Y78 C79 W80 P81 P82 L83 D84 K85 K86 R87 D88 A89 E90 K93 A94 W98 L99 I102 S103 D104 G107 A108 G109

V113 V114 A115 S116 I117 F118 L119 S120 F126 V127 H128 L129 L130 Y131 H132 V137 M138 L139 I142 K143 R144 D145 A146 D147 A148 G149 N150 V151 F152 I153 S154 E155 A156 L157 Q158 S159 K160 I161 Q162 D163 P164 Q165 K166 A167 L168 A169 R170 N171 K172 L173 A174 R175 Q176 K177 Y178 L179 K180

V181 L182 Q183 K184 E185 M186 L187 V188 I189 E190 E191 TYR GLN ARG LYS ASP VAL VAL ASP ARG ALA VAL VAL ARG GLY ASN ILE ASP GLN

TRP ASN THR ILE MET GLN LEU LEU LYS GLU MET GLU LYS GLU VAL ASP VAL VAL ASP ALA VAL VAL ARG GLY ASN ILE ASP GLN

- Molecule 4: HAUS augmin like complex subunit 7 S homeolog

Chain G:

7%

93%

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

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

GLN ILE SER PHE ILE GLY GLN LEU LEU ASP VAL ILE GLN TYR PRO ASP ASP THR ILE SER SER ASN VAL ILE LEU GLU SER LEU GLN SER LEU SER HIS SER THR GLU GLU LYS ASN V142 V143 T144 C145 I146 R147 E148 N149 E150 E151 L152 L153 K154 E155 L156 F157 S158 S159 P160 HIS PHE GLN ALA THR LEU SER

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

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

• Molecule 5: HAUS augmin-like complex subunit 8

Chain H:

8%

10% 88%

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

VAL CYS SER GLY GLY LYS VAL PRO GLU ARG GLY SER GLY GLY THR PRO THR ARG ARG SER LEU ALA PRO HIS LYS ALA LYS LYS ILE THR ALA ALA VAL PRO LEU PRO ALA LEU ASP GLY SER ILE PHE THR LYS GLU ASP LEU GLN SER THR LEU ASP LEU ASP GLY HIS ARG ILE ALA ARG PRO

ASP LEU ASP LEU SER VAL ILE ASN ASP ARG THR LEU GLN LYS ILE THR PRO ARG PRO VAL VAL THR SER GLU GLN LYS LYS PRO LYS ARG ASP THR THR PRO VAL ASN LEU VAL P156 E157 D158 M159 V160 E161 M162 I163 E164 S165 Q166 T167 L168 L169 L170 T171 Y172 L173 T174 I175 K176 M177

Q178 K179 N180 L181 F182 R183 L184 E185 E186 LYS ALA GLU ARG ASN LEU LEU LEU VAL ASN ASP GLN LYS ASP GLN LEU GLN GLU THR ILE HIS MET MET LYS ARG ASP ASP LEU THR LEU LEU GLN ARG GLU GLU ARG LEU ARG ASP LEU ILE GLU LYS GLN ASP GLU VAL LEU THR PRO VAL VAL

THR SER LYS ASP PRO PHE LYS ASP ASN TYR THR THR PHE ALA THR ALA LEU ASP SER THR

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	1772567	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 $(e^-/\text{Å}^2)$	15.0	Depositor
Minimum defocus (nm)	2000	Depositor
Maximum defocus (nm)	3500	Depositor
Magnification	105000	Depositor
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	1.446	Depositor
Minimum map value	-0.741	Depositor
Average map value	0.003	Depositor
Map value standard deviation	0.033	Depositor
Recommended contour level	0.121	Depositor
Map size (Å)	570.836, 570.836, 570.836	wwPDB
Map dimensions	406, 406, 406	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.406, 1.406, 1.406	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: GTP, MG, G2P

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	0.50	0/3433	0.50	0/4662
1	C	0.48	0/3433	0.49	0/4662
2	B	0.50	0/3433	0.49	0/4650
3	F	0.23	0/1524	0.46	0/2053
4	G	0.18	0/154	0.42	0/207
5	H	0.30	0/262	0.49	0/350
All	All	0.46	0/12239	0.49	0/16584

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3356	0	3264	52	0
1	C	3356	0	3264	69	0
2	B	3358	0	3234	73	0
3	F	1485	0	1492	58	0
4	G	153	0	155	15	0
5	H	260	0	270	30	0
6	A	32	0	12	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	C	32	0	12	4	0
7	A	1	0	0	0	0
7	B	1	0	0	0	0
7	C	1	0	0	0	0
8	B	32	0	13	3	0
All	All	12067	0	11716	273	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 12.

All (273) 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:143:THR:O	2:B:147:MET:HB3	1.68	0.93
1:A:228:ASN:HD21	6:A:501:GTP:HN1	1.23	0.86
2:B:49:VAL:HG11	2:B:241:ARG:HG2	1.64	0.77
1:C:437:VAL:O	2:B:391:ARG:NH2	2.18	0.77
1:C:255:PHE:HE1	1:C:378:LEU:HD13	1.52	0.73
2:B:262:ARG:HD3	3:F:116:SER:HB3	1.69	0.73
1:C:394:LYS:HA	1:C:397:LEU:HD12	1.69	0.73
1:A:313:MET:HE2	1:A:382:THR:HG22	1.74	0.70
1:C:206:ASN:OD1	6:C:501:GTP:N2	2.25	0.69
5:H:171:THR:O	5:H:175:ILE:HG12	1.94	0.67
8:B:501:G2P:O1G	8:B:501:G2P:O1B	2.11	0.67
1:C:265:ILE:HD11	1:C:435:VAL:HG21	1.77	0.66
3:F:68:ASP:OD1	3:F:72:CYS:N	2.29	0.66
2:B:238:THR:HG21	2:B:318:ARG:HD2	1.79	0.65
1:C:79:ARG:NH2	1:C:92:LEU:O	2.30	0.65
1:A:50:ASN:O	1:A:64:ARG:NH2	2.30	0.65
1:A:71:GLU:HG2	1:A:72:PRO:HD2	1.79	0.65
1:C:151:SER:HB2	1:C:193:THR:HG21	1.78	0.64
2:B:215:LEU:HB3	2:B:217:LEU:HD13	1.81	0.63
4:G:153:LEU:HD22	5:H:173:LEU:HD21	1.81	0.63
1:C:175:PRO:HB3	1:C:390:ARG:HD3	1.81	0.62
1:C:313:MET:HE2	1:C:382:THR:HG22	1.79	0.62
2:B:275:SER:OG	2:B:276:ARG:N	2.32	0.62
3:F:114:VAL:HG12	3:F:116:SER:H	1.65	0.62
4:G:146:ILE:HG12	5:H:166:GLN:HE22	1.63	0.62
2:B:64:ILE:HD13	2:B:120:VAL:HG12	1.80	0.62
4:G:149:ASN:HD21	5:H:170:LEU:HD11	1.65	0.62
4:G:147:ARG:CZ	4:G:147:ARG:HA	2.29	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:F:167:ALA:HB1	5:H:163:ILE:HG21	1.82	0.62
2:B:152:ILE:HG12	2:B:164:MET:HE2	1.82	0.61
1:C:228:ASN:HD21	6:C:501:GTP:HN1	1.47	0.61
3:F:18:LEU:HD22	5:H:169:LEU:HD13	1.83	0.61
1:A:330:ALA:O	1:A:334:THR:HG23	2.01	0.60
2:B:375:GLN:HE22	2:B:423:GLN:HB2	1.65	0.60
5:H:157:GLU:O	5:H:161:GLU:HG2	2.02	0.60
5:H:165:SER:O	5:H:169:LEU:HG	2.01	0.60
1:A:377:MET:HE3	1:A:379:SER:HB3	1.83	0.60
1:C:187:SER:OG	1:C:391:LEU:HD21	2.02	0.59
2:B:145:SER:OG	2:B:146:GLY:N	2.35	0.59
2:B:117:LEU:HD21	2:B:154:LYS:HB3	1.84	0.59
2:B:67:ASP:OD1	2:B:68:LEU:N	2.34	0.57
1:A:105:ARG:HG3	1:A:411:GLU:HG2	1.87	0.57
2:B:219:THR:O	2:B:219:THR:OG1	2.22	0.57
2:B:347:ASN:ND2	1:A:180:ALA:O	2.38	0.57
3:F:172:LYS:HG2	3:F:176:GLN:NE2	2.20	0.57
1:A:276:ILE:HD11	1:A:286:LEU:HD11	1.86	0.57
2:B:256:ASN:HD21	1:A:101:ASN:HD22	1.52	0.56
1:A:205:ASP:OD2	1:A:206:ASN:N	2.38	0.56
3:F:180:LYS:O	3:F:184:LYS:HG3	2.05	0.56
3:F:116:SER:HA	3:F:119:LEU:HD13	1.88	0.56
1:C:27:GLU:HG3	1:C:361:THR:HG21	1.88	0.55
1:A:320:ARG:HG2	1:A:358:GLN:O	2.05	0.55
5:H:161:GLU:HA	5:H:164:GLU:HG3	1.88	0.55
1:A:174:ALA:HB3	1:A:177:VAL:O	2.06	0.55
3:F:161:ILE:HD12	3:F:166:LYS:HG3	1.87	0.55
4:G:150:GLU:O	4:G:154:LYS:HE3	2.07	0.55
1:C:276:ILE:HD13	1:C:281:ALA:HB2	1.88	0.54
1:C:326:LYS:HD3	2:B:220:PRO:HD2	1.89	0.54
3:F:173:LEU:O	3:F:177:LYS:HG3	2.06	0.54
2:B:141:GLY:HA3	8:B:501:G2P:H3A1	1.90	0.54
1:A:217:LEU:HD21	1:A:275:VAL:HG12	1.88	0.54
3:F:23:LEU:HD11	3:F:137:VAL:HG21	1.90	0.54
2:B:406:MET:O	2:B:410:GLU:HG2	2.07	0.54
2:B:273:LEU:H	2:B:292:GLN:HE22	1.56	0.54
3:F:173:LEU:C	3:F:177:LYS:HZ2	2.16	0.54
3:F:156:ALA:O	3:F:170:ARG:NH1	2.37	0.53
5:H:181:LEU:HA	5:H:184:LEU:HD12	1.90	0.53
2:B:178:THR:HB	2:B:181:GLU:HG3	1.89	0.53
3:F:55:ALA:O	3:F:59:VAL:HG22	2.09	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:48:SER:HB2	1:A:243:ARG:O	2.09	0.53
3:F:175:ARG:HD2	3:F:176:GLN:N	2.23	0.53
1:C:31:GLN:HE21	1:C:37:PRO:HG3	1.73	0.53
2:B:173:PRO:HG3	2:B:380:ARG:HD2	1.91	0.52
2:B:303:CYS:SG	2:B:377:LEU:HB2	2.49	0.52
1:A:155:GLU:HG3	1:A:197:HIS:CE1	2.45	0.52
1:C:12:ALA:O	1:C:16:ILE:HG13	2.10	0.52
1:C:20:CYS:HA	1:C:232:SER:HB2	1.92	0.52
1:C:168:GLU:OE2	1:C:194:THR:OG1	2.21	0.51
1:C:223:THR:OG1	1:C:224:TYR:N	2.43	0.51
1:A:216:ASN:HB3	1:A:275:VAL:O	2.10	0.51
4:G:149:ASN:ND2	5:H:170:LEU:HD11	2.25	0.51
1:A:27:GLU:OE1	1:A:243:ARG:NH1	2.35	0.51
1:A:278:ALA:HA	1:A:369:ALA:HB2	1.93	0.51
1:A:269:LEU:HD22	1:A:303:VAL:HG11	1.92	0.51
1:A:121:ARG:HH12	1:A:124:LYS:HD2	1.75	0.51
1:C:21:TRP:CZ2	1:C:65:ALA:HB2	2.46	0.50
1:C:220:GLU:HG2	1:C:221:ARG:H	1.77	0.50
3:F:16:MET:O	3:F:20:LEU:N	2.38	0.50
1:A:70:LEU:HD13	1:A:110:ILE:HG22	1.93	0.50
2:B:10:GLY:O	2:B:14:ASN:ND2	2.45	0.50
1:A:215:ARG:NH2	1:A:299:ALA:O	2.44	0.50
3:F:157:LEU:N	3:F:170:ARG:HH22	2.09	0.50
1:C:397:LEU:O	1:C:400:ALA:HB3	2.12	0.49
5:H:166:GLN:O	5:H:170:LEU:HG	2.11	0.49
2:B:257:MET:HA	2:B:312:THR:HG21	1.94	0.49
1:A:53:PHE:HB3	1:A:61:HIS:HB3	1.94	0.49
2:B:267:MET:HE1	2:B:303:CYS:HB2	1.93	0.49
2:B:20:PHE:HA	2:B:230:SER:HB3	1.94	0.49
2:B:192:LEU:HD23	2:B:199:THR:HG21	1.94	0.49
1:A:108:TYR:HA	1:A:112:LYS:HE2	1.93	0.49
2:B:61:PRO:HD3	2:B:84:ILE:HG22	1.94	0.49
2:B:137:HIS:NE2	2:B:168:SER:HB3	2.28	0.49
2:B:385:PHE:CE1	2:B:412:GLU:HB2	2.48	0.49
1:C:419:SER:O	1:C:423:GLU:HG2	2.13	0.48
2:B:209:ASP:OD1	2:B:213:ARG:NH2	2.46	0.48
3:F:11:TRP:HA	3:F:14:GLU:HB3	1.95	0.48
3:F:23:LEU:HD13	3:F:66:LYS:HG2	1.95	0.48
1:C:326:LYS:HD2	2:B:212:PHE:HZ	1.78	0.48
1:A:52:PHE:CD2	1:A:243:ARG:HD3	2.48	0.48
1:A:387:ALA:O	1:A:390:ARG:HG2	2.12	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:F:98:TRP:O	3:F:102:ILE:HG12	2.13	0.48
1:C:387:ALA:O	1:C:390:ARG:HG2	2.13	0.48
2:B:204:ASN:OD1	8:B:501:G2P:N2	2.40	0.48
1:A:113:GLU:HG3	1:A:114:ILE:HG12	1.95	0.48
1:A:195:LEU:HD21	1:A:428:LEU:HD22	1.96	0.48
1:A:102:ASN:HB3	1:A:105:ARG:HB2	1.96	0.48
1:C:228:ASN:ND2	6:C:501:GTP:HN1	2.11	0.48
3:F:178:TYR:CE1	4:G:152:LEU:HB3	2.49	0.48
1:C:312:TYR:O	1:C:344:VAL:HG23	2.14	0.48
2:B:213:ARG:NH1	2:B:297:LYS:HD2	2.28	0.48
3:F:171:ASN:HA	5:H:167:THR:HG22	1.96	0.48
2:B:285:THR:HB	2:B:287:PRO:HD2	1.94	0.48
3:F:177:LYS:HA	3:F:180:LYS:HE2	1.96	0.48
2:B:81:PHE:HD2	2:B:84:ILE:HD11	1.79	0.48
1:C:275:VAL:HG12	1:C:368:LEU:HD21	1.95	0.47
2:B:262:ARG:HD3	3:F:116:SER:CB	2.40	0.47
1:A:1:MET:O	1:A:2:ARG:HG2	2.14	0.47
3:F:138:MET:HE3	5:H:172:TYR:CD2	2.49	0.47
3:F:183:GLN:O	3:F:187:LEU:HG	2.14	0.47
1:C:191:THR:HA	1:C:194:THR:HG22	1.96	0.47
1:C:151:SER:CB	1:C:193:THR:HG21	2.44	0.47
1:C:377:MET:HE3	1:C:379:SER:HB3	1.96	0.47
1:A:189:LEU:HD13	1:A:413:MET:HE1	1.95	0.47
5:H:164:GLU:O	5:H:167:THR:OG1	2.29	0.47
1:C:165:SER:HB2	1:C:256:GLN:HE22	1.79	0.47
2:B:403:MET:HE2	2:B:403:MET:HB3	1.72	0.46
3:F:172:LYS:HE2	3:F:172:LYS:HB3	1.65	0.46
3:F:177:LYS:O	3:F:181:VAL:HG22	2.15	0.46
4:G:147:ARG:HA	4:G:147:ARG:NH1	2.31	0.46
1:C:320:ARG:HG2	1:C:358:GLN:O	2.14	0.46
1:C:405:VAL:O	1:C:409:VAL:HG23	2.16	0.46
1:C:439:SER:O	1:C:439:SER:OG	2.33	0.46
2:B:206:ALA:O	2:B:210:ILE:HG12	2.14	0.46
1:C:1:MET:C	1:C:2:ARG:HG2	2.41	0.46
2:B:73:MET:HG3	2:B:92:PHE:HB3	1.97	0.46
1:A:28:HIS:NE2	1:A:243:ARG:HD2	2.31	0.46
1:A:173:PRO:HB3	1:A:183:GLU:OE2	2.16	0.46
3:F:163:ASP:HB3	3:F:166:LYS:HD2	1.98	0.46
1:C:220:GLU:HG2	1:C:221:ARG:N	2.31	0.46
2:B:317:PHE:HB3	2:B:321:MET:SD	2.55	0.46
3:F:138:MET:HE2	3:F:138:MET:HB3	1.77	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:50:ASN:O	1:C:64:ARG:NH2	2.49	0.45
1:C:205:ASP:OD2	1:C:206:ASN:N	2.49	0.45
2:B:175:VAL:HG23	2:B:175:VAL:O	2.16	0.45
1:A:20:CYS:HA	1:A:232:SER:HB2	1.97	0.45
3:F:139:LEU:HD11	3:F:157:LEU:HD23	1.97	0.45
2:B:406:MET:HE3	2:B:406:MET:HB3	1.80	0.45
1:C:164:LYS:HA	1:C:164:LYS:HD3	1.79	0.45
2:B:116:VAL:O	2:B:120:VAL:HG13	2.16	0.45
1:C:434:GLU:O	1:C:437:VAL:HG12	2.17	0.45
1:C:185:TYR:O	1:C:189:LEU:HG	2.17	0.45
2:B:44:LEU:HD23	2:B:44:LEU:HA	1.83	0.45
2:B:290:THR:HG21	2:B:329:GLN:HE21	1.81	0.45
1:A:205:ASP:O	1:A:209:ILE:HG13	2.17	0.45
3:F:160:LYS:O	3:F:160:LYS:HD3	2.17	0.45
1:C:231:ILE:O	1:C:235:VAL:HG23	2.17	0.45
2:B:143:THR:O	2:B:147:MET:CB	2.54	0.45
3:F:75:VAL:HG22	3:F:94:ALA:HB1	1.97	0.45
3:F:138:MET:O	3:F:142:ILE:HG12	2.16	0.45
1:C:119:LEU:HA	1:C:119:LEU:HD23	1.68	0.45
3:F:166:LYS:HE2	3:F:166:LYS:HB3	1.87	0.45
2:B:51:TYR:HB3	2:B:59:TYR:HB3	1.97	0.45
3:F:117:ILE:HG22	3:F:126:PHE:HD2	1.82	0.45
4:G:153:LEU:HD21	5:H:170:LEU:HD23	1.97	0.45
1:A:52:PHE:CE2	1:A:243:ARG:HD3	2.52	0.45
3:F:20:LEU:HD23	3:F:20:LEU:HA	1.80	0.45
3:F:69:ASN:OD1	3:F:70:VAL:N	2.50	0.45
1:A:119:LEU:HD23	1:A:119:LEU:HA	1.75	0.44
1:A:326:LYS:HG3	1:A:327:ASP:N	2.32	0.44
2:B:172:SER:OG	2:B:205:GLU:OE2	2.34	0.44
2:B:192:LEU:O	2:B:196:THR:HG22	2.18	0.44
1:C:216:ASN:HB3	1:C:275:VAL:O	2.17	0.44
3:F:172:LYS:HG2	3:F:176:GLN:HE21	1.81	0.44
1:C:16:ILE:HG12	1:C:228:ASN:ND2	2.32	0.44
1:A:234:ILE:HD13	1:A:270:ALA:HB1	1.99	0.44
3:F:15:HIS:CE1	5:H:162:MET:HG3	2.53	0.44
3:F:152:PHE:HA	3:F:155:GLU:HG3	1.99	0.44
1:C:224:TYR:OH	6:C:501:GTP:O2'	2.32	0.44
2:B:1:MET:HE2	2:B:1:MET:HB2	1.92	0.44
2:B:135:LEU:HD23	2:B:152:ILE:HD11	1.99	0.44
3:F:69:ASN:OD1	3:F:70:VAL:HG13	2.18	0.44
1:C:195:LEU:HD21	1:C:428:LEU:HD13	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:168:GLU:OE2	1:A:194:THR:OG1	2.25	0.44
3:F:9:LEU:HB3	3:F:12:GLN:HG3	2.00	0.44
4:G:151:GLU:OE2	4:G:154:LYS:HD2	2.18	0.44
1:C:139:HIS:CD2	1:C:150:THR:HG21	2.53	0.44
2:B:284:LEU:HD23	2:B:362:LYS:HG2	1.99	0.44
2:B:344:TRP:CE3	2:B:345:ILE:HG13	2.52	0.44
3:F:99:LEU:HB3	3:F:113:VAL:HG11	1.99	0.44
2:B:198:GLU:HB2	2:B:266:PHE:CE2	2.53	0.44
3:F:184:LYS:HB2	3:F:184:LYS:HE3	1.89	0.44
1:C:12:ALA:HB3	1:C:140:SER:HB3	1.98	0.43
1:C:203:MET:HE2	1:C:203:MET:HB2	1.81	0.43
1:A:397:LEU:HD23	1:A:397:LEU:HA	1.79	0.43
4:G:146:ILE:HG12	5:H:166:GLN:NE2	2.32	0.43
1:C:47:ASP:HB3	1:C:48:SER:H	1.67	0.43
1:C:69:ASP:OD2	1:C:70:LEU:N	2.52	0.43
2:B:106:TYR:CE2	2:B:403:MET:HG2	2.53	0.43
1:A:21:TRP:CZ2	1:A:65:ALA:HB2	2.53	0.43
3:F:176:GLN:O	3:F:180:LYS:HG3	2.19	0.43
5:H:183:ARG:CZ	5:H:183:ARG:HB3	2.46	0.43
2:B:21:TRP:CH2	2:B:61:PRO:HB3	2.53	0.43
3:F:173:LEU:HB3	3:F:177:LYS:NZ	2.34	0.43
3:F:17:TRP:O	3:F:20:LEU:HB2	2.18	0.43
4:G:151:GLU:O	4:G:155:GLU:HG2	2.19	0.43
5:H:176:LYS:HG2	5:H:179:LYS:NZ	2.32	0.43
5:H:182:PHE:HA	5:H:185:GLU:OE2	2.19	0.43
1:C:53:PHE:O	1:C:64:ARG:NH2	2.51	0.43
5:H:174:THR:O	5:H:177:MET:HG3	2.19	0.43
2:B:121:ARG:O	2:B:125:GLU:HG2	2.19	0.42
2:B:242:PHE:CD1	2:B:356:ILE:HG13	2.54	0.42
1:C:234:ILE:HD12	1:C:302:MET:HE2	2.02	0.42
2:B:166:THR:OG1	2:B:199:THR:HG23	2.19	0.42
2:B:120:VAL:HG21	2:B:155:ILE:HD11	2.01	0.42
1:A:265:ILE:HG23	1:A:432:TYR:CZ	2.54	0.42
2:B:38:GLY:HA3	2:B:43:GLN:OE1	2.20	0.42
1:A:265:ILE:HD13	1:A:435:VAL:HG11	2.00	0.42
3:F:57:TYR:OH	3:F:88:ASP:OD1	2.28	0.42
3:F:142:ILE:HD11	5:H:172:TYR:HA	2.00	0.42
1:A:262:TYR:HD2	1:A:265:ILE:HD12	1.85	0.42
3:F:69:ASN:O	3:F:73:LYS:HE2	2.20	0.42
3:F:155:GLU:HA	3:F:158:GLN:HE21	1.85	0.42
5:H:175:ILE:HA	5:H:178:GLN:OE1	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:188:ILE:HG22	1:A:421:ALA:HB1	2.01	0.42
3:F:181:VAL:HG21	5:H:174:THR:HG22	2.02	0.42
1:C:405:VAL:HA	1:C:408:TYR:HD2	1.84	0.42
2:B:62:ARG:HG3	2:B:123:GLU:OE1	2.20	0.42
2:B:84:ILE:HD13	2:B:84:ILE:HG21	1.82	0.42
1:C:174:ALA:HB3	1:C:177:VAL:O	2.20	0.42
1:C:192:HIS:O	1:C:192:HIS:ND1	2.53	0.42
1:C:262:TYR:HB3	1:C:263:PRO:HD2	2.01	0.42
3:F:81:PRO:HA	3:F:82:PRO:HD3	1.81	0.42
1:A:81:GLY:O	1:A:84:ARG:HG2	2.19	0.41
1:A:175:PRO:HB3	1:A:390:ARG:HD3	2.01	0.41
5:H:177:MET:HE3	5:H:181:LEU:HD23	2.02	0.41
1:C:93:ILE:HG21	1:C:118:VAL:HG12	2.02	0.41
3:F:49:ASP:C	3:F:50:LYS:HD2	2.45	0.41
1:C:209:ILE:H	1:C:209:ILE:HG12	1.67	0.41
1:C:319:TYR:CD2	1:C:375:VAL:HG22	2.55	0.41
2:B:21:TRP:CZ3	2:B:61:PRO:HB3	2.56	0.41
1:A:125:LEU:HD12	1:A:125:LEU:HA	1.85	0.41
3:F:154:SER:O	3:F:158:GLN:HG3	2.20	0.41
4:G:153:LEU:HD22	5:H:173:LEU:CD2	2.50	0.41
1:C:165:SER:HA	1:C:199:ASP:OD1	2.20	0.41
2:B:249:ASP:OD1	2:B:252:LYS:HB2	2.21	0.41
2:B:267:MET:HE2	2:B:301:ALA:HB3	2.03	0.41
1:C:172:TYR:CG	1:C:173:PRO:HD2	2.56	0.41
2:B:198:GLU:HG3	2:B:200:TYR:HE1	1.86	0.41
1:C:195:LEU:HD13	1:C:264:ARG:HH12	1.86	0.41
2:B:117:LEU:HA	2:B:120:VAL:HG22	2.03	0.41
1:C:177:VAL:O	1:C:177:VAL:HG23	2.21	0.41
1:C:395:PHE:CD1	1:C:422:ARG:HD3	2.56	0.41
2:B:350:LYS:HA	1:A:179:THR:O	2.20	0.41
1:C:1:MET:O	1:C:2:ARG:HG2	2.21	0.40
1:A:174:ALA:HB2	1:A:205:ASP:OD2	2.21	0.40
3:F:157:LEU:HD21	5:H:168:LEU:HB2	2.03	0.40
5:H:159:MET:HG3	5:H:160:VAL:N	2.36	0.40
1:C:75:ILE:CG2	1:C:92:LEU:HB3	2.51	0.40
2:B:139:LEU:HD13	2:B:168:SER:HB2	2.04	0.40
3:F:168:LEU:HD23	3:F:169:ALA:N	2.35	0.40
2:B:81:PHE:CD2	2:B:84:ILE:HD11	2.57	0.40
4:G:146:ILE:HG23	5:H:166:GLN:HE22	1.87	0.40
4:G:149:ASN:O	4:G:153:LEU:HG	2.21	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	426/451 (94%)	406 (95%)	20 (5%)	0	100	100
1	C	426/451 (94%)	405 (95%)	21 (5%)	0	100	100
2	B	425/445 (96%)	404 (95%)	21 (5%)	0	100	100
3	F	181/289 (63%)	177 (98%)	4 (2%)	0	100	100
4	G	17/282 (6%)	16 (94%)	1 (6%)	0	100	100
5	H	29/260 (11%)	28 (97%)	1 (3%)	0	100	100
All	All	1504/2178 (69%)	1436 (96%)	68 (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	359/379 (95%)	347 (97%)	12 (3%)	33	60
1	C	359/379 (95%)	335 (93%)	24 (7%)	13	38
2	B	369/383 (96%)	352 (95%)	17 (5%)	23	50
3	F	154/251 (61%)	151 (98%)	3 (2%)	52	72
4	G	19/258 (7%)	18 (95%)	1 (5%)	19	46
5	H	31/230 (14%)	31 (100%)	0	100	100
All	All	1291/1880 (69%)	1234 (96%)	57 (4%)	26	52

All (57) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	66	VAL
1	C	70	LEU
1	C	80	THR
1	C	82	THR
1	C	88	HIS
1	C	90	GLU
1	C	94	THR
1	C	151	SER
1	C	170	SER
1	C	186	ASN
1	C	193	THR
1	C	196	GLU
1	C	209	ILE
1	C	214	ARG
1	C	229	ARG
1	C	239	THR
1	C	275	VAL
1	C	276	ILE
1	C	277	SER
1	C	315	CYS
1	C	344	VAL
1	C	362	VAL
1	C	378	LEU
1	C	381	THR
2	B	12	CYS
2	B	24	ILE
2	B	48	ASN
2	B	60	VAL
2	B	65	LEU
2	B	84	ILE
2	B	117	LEU
2	B	131	GLN
2	B	228	LEU
2	B	255	VAL
2	B	274	THR
2	B	285	THR
2	B	289	LEU
2	B	293	MET
2	B	312	THR
2	B	313	VAL
2	B	399	THR
1	A	66	VAL

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Mol	Chain	Res	Type
1	A	74	VAL
1	A	82	THR
1	A	88	HIS
1	A	94	THR
1	A	137	VAL
1	A	193	THR
1	A	204	VAL
1	A	304	LYS
1	A	349	THR
1	A	361	THR
1	A	413	MET
3	F	41	VAL
3	F	79	CYS
3	F	168	LEU
4	G	142	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (38) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	8	HIS
1	C	107	HIS
1	C	176	GLN
1	C	228	ASN
1	C	256	GLN
1	C	300	ASN
1	C	309	HIS
1	C	329	ASN
2	B	6	HIS
2	B	28	HIS
2	B	57	ASN
2	B	134	GLN
2	B	190	HIS
2	B	256	ASN
2	B	329	GLN
2	B	335	ASN
2	B	347	ASN
2	B	348	ASN
2	B	375	GLN
2	B	396	HIS
2	B	426	GLN
1	A	15	GLN
1	A	61	HIS

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Mol	Chain	Res	Type
1	A	102	ASN
1	A	197	HIS
1	A	226	ASN
1	A	228	ASN
1	A	258	ASN
1	A	283	HIS
1	A	300	ASN
1	A	329	ASN
1	A	380	ASN
1	A	406	HIS
3	F	112	GLN
3	F	132	HIS
3	F	158	GLN
3	F	176	GLN
4	G	149	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 6 ligands modelled in this entry, 3 are monoatomic - leaving 3 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
8	G2P	B	501	7	25,34,34	3.95	11 (44%)	32,54,54	1.82	5 (15%)
6	GTP	A	501	7	29,34,34	3.77	19 (65%)	35,54,54	1.54	4 (11%)
6	GTP	C	501	7	29,34,34	3.83	19 (65%)	35,54,54	1.65	7 (20%)

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
8	G2P	B	501	7	-	6/15/38/38	0/3/3/3
6	GTP	A	501	7	-	5/18/38/38	0/3/3/3
6	GTP	C	501	7	-	5/18/38/38	0/3/3/3

All (49) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	B	501	G2P	O4'-C1'	15.49	1.61	1.40
6	C	501	GTP	C2'-C3'	-11.37	1.22	1.53
6	A	501	GTP	C2'-C3'	-11.36	1.22	1.53
6	C	501	GTP	O4'-C1'	-8.23	1.30	1.40
6	A	501	GTP	O4'-C1'	-7.55	1.31	1.40
8	B	501	G2P	O4'-C4'	-6.57	1.30	1.45
8	B	501	G2P	C2-N2	5.51	1.44	1.33
6	A	501	GTP	C2-N3	5.24	1.46	1.33
6	C	501	GTP	C2-N2	5.07	1.46	1.34
6	C	501	GTP	C2-N3	5.07	1.45	1.33
6	A	501	GTP	C2-N2	5.05	1.46	1.34
6	C	501	GTP	PB-O3A	4.90	1.64	1.59
6	A	501	GTP	C4-N3	4.83	1.48	1.37
6	A	501	GTP	PB-O3A	4.70	1.64	1.59
6	A	501	GTP	PA-O3A	4.65	1.64	1.59
6	C	501	GTP	PA-O3A	4.52	1.64	1.59
6	C	501	GTP	C4-N3	4.48	1.48	1.37
6	C	501	GTP	PB-O3B	4.30	1.64	1.59
6	A	501	GTP	C5'-C4'	-4.11	1.39	1.51
6	C	501	GTP	C5'-C4'	-4.02	1.39	1.51
8	B	501	G2P	PB-O3B	3.92	1.62	1.58
6	A	501	GTP	PB-O3B	3.92	1.63	1.59
6	C	501	GTP	C5-C4	-3.71	1.33	1.43
6	A	501	GTP	C5-C4	-3.20	1.35	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	C	501	GTP	C1'-N9	-3.13	1.41	1.50
8	B	501	G2P	O3'-C3'	-3.11	1.35	1.43
6	C	501	GTP	O3'-C3'	2.95	1.50	1.43
6	A	501	GTP	O3'-C3'	2.89	1.50	1.43
8	B	501	G2P	O6-C6	-2.88	1.17	1.24
6	A	501	GTP	C1'-N9	-2.85	1.42	1.50
6	A	501	GTP	C6-N1	2.77	1.42	1.37
6	C	501	GTP	C6-N1	2.73	1.42	1.37
6	A	501	GTP	C5-C6	2.71	1.52	1.47
8	B	501	G2P	C5-C6	-2.64	1.36	1.41
8	B	501	G2P	PA-O1A	-2.60	1.50	1.56
8	B	501	G2P	C1'-N9	-2.59	1.43	1.49
8	B	501	G2P	O2'-C2'	2.57	1.49	1.43
6	C	501	GTP	O4'-C4'	2.49	1.50	1.45
8	B	501	G2P	PB-O1B	-2.43	1.50	1.56
6	A	501	GTP	O4'-C4'	2.34	1.50	1.45
6	C	501	GTP	C5-C6	2.26	1.51	1.47
6	C	501	GTP	O6-C6	-2.26	1.18	1.23
6	A	501	GTP	C2-N1	2.23	1.43	1.37
6	C	501	GTP	C2-N1	2.19	1.42	1.37
6	A	501	GTP	C3'-C4'	2.17	1.58	1.53
6	A	501	GTP	O2'-C2'	2.16	1.48	1.43
6	C	501	GTP	O2'-C2'	2.16	1.48	1.43
6	C	501	GTP	C3'-C4'	2.10	1.58	1.53
6	A	501	GTP	O6-C6	-2.09	1.18	1.23

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
8	B	501	G2P	N3-C2-N1	-5.30	120.48	127.21
8	B	501	G2P	PB-O3B-PG	-4.90	114.90	132.45
6	C	501	GTP	C4'-O4'-C1'	-4.85	105.48	109.92
8	B	501	G2P	C2-N3-C4	4.62	120.47	115.48
6	C	501	GTP	C5-C6-N1	3.68	121.09	114.07
6	A	501	GTP	C4'-O4'-C1'	-3.65	106.59	109.92
6	C	501	GTP	C2-N1-C6	-3.45	118.80	125.11
6	A	501	GTP	C8-N7-C5	3.44	108.41	102.55
6	C	501	GTP	C8-N7-C5	3.30	108.17	102.55
6	A	501	GTP	C5-C6-N1	3.26	120.29	114.07
6	A	501	GTP	C2-N1-C6	-3.14	119.36	125.11
8	B	501	G2P	C4'-O4'-C1'	-2.62	107.53	109.92
6	C	501	GTP	O6-C6-C5	-2.45	119.46	124.32

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	C	501	GTP	O4'-C1'-N9	2.13	111.57	108.75
6	C	501	GTP	C5'-C4'-C3'	-2.02	107.93	115.21
8	B	501	G2P	C2-N1-C6	2.01	118.76	115.96

There are no chirality outliers.

All (16) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	C	501	GTP	C5'-O5'-PA-O3A
6	C	501	GTP	C5'-O5'-PA-O1A
6	A	501	GTP	C5'-O5'-PA-O3A
6	A	501	GTP	C5'-O5'-PA-O1A
8	B	501	G2P	PB-O3B-PG-O1G
8	B	501	G2P	C5'-O5'-PA-C3A
8	B	501	G2P	O4'-C4'-C5'-O5'
8	B	501	G2P	C3'-C4'-C5'-O5'
6	A	501	GTP	PB-O3B-PG-O2G
6	C	501	GTP	C5'-O5'-PA-O2A
6	A	501	GTP	C5'-O5'-PA-O2A
6	C	501	GTP	C3'-C4'-C5'-O5'
8	B	501	G2P	PB-O3B-PG-O3G
6	A	501	GTP	C3'-C4'-C5'-O5'
8	B	501	G2P	PB-O3B-PG-O2G
6	C	501	GTP	PB-O3A-PA-O2A
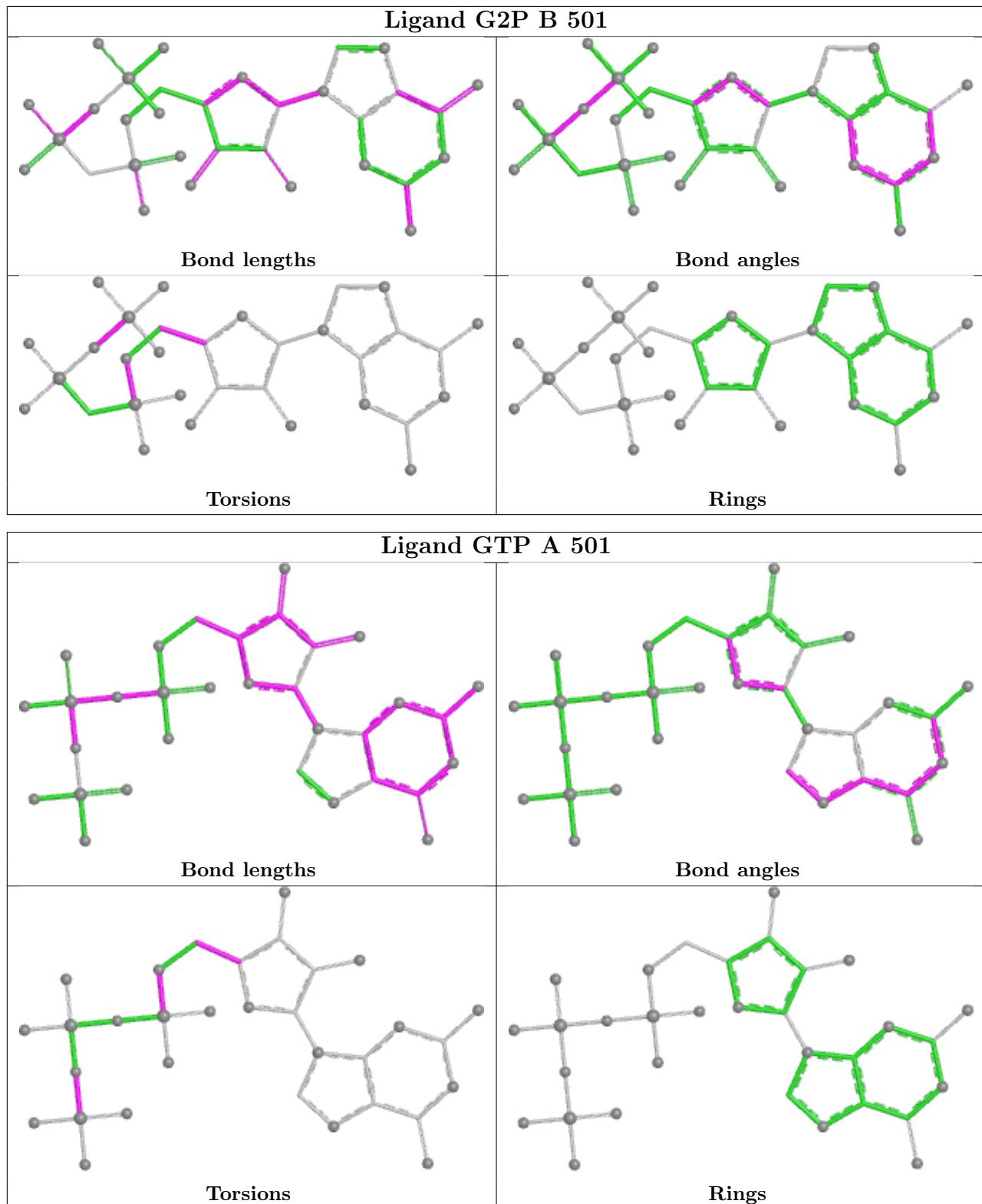
There are no ring outliers.
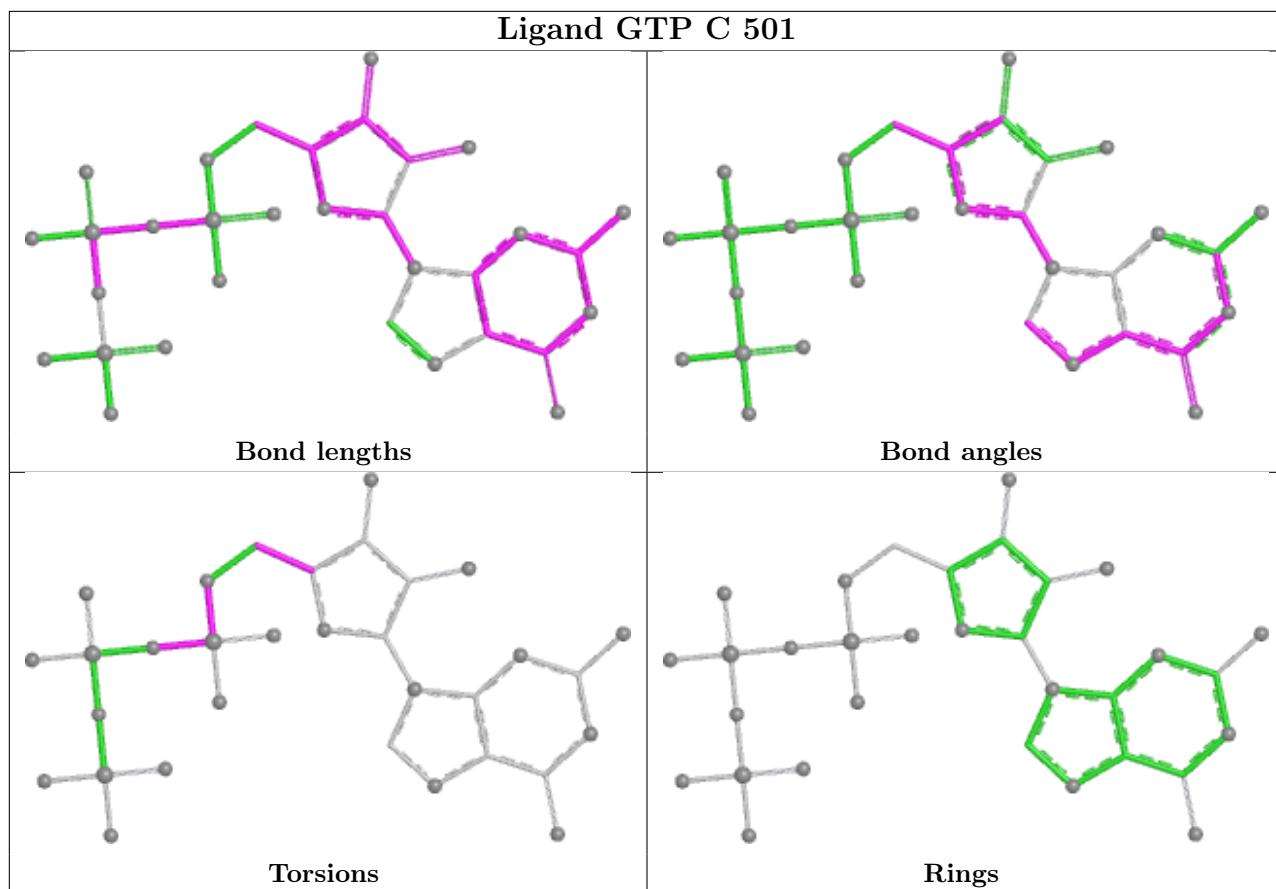
3 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	B	501	G2P	3	0
6	A	501	GTP	1	0
6	C	501	GTP	4	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 G2P B 501

Bond lengths

Bond angles

Torsions

Rings

Ligand GTP A 501

Bond lengths

Bond angles

Torsions

Rings

Ligand GTP C 501

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.
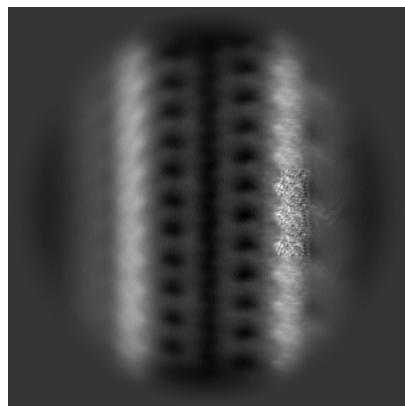
6 Map visualisation ⓘ

This section contains visualisations of the EMDB entry EMD-46489. These allow visual inspection of the internal detail of the map and identification of artifacts.
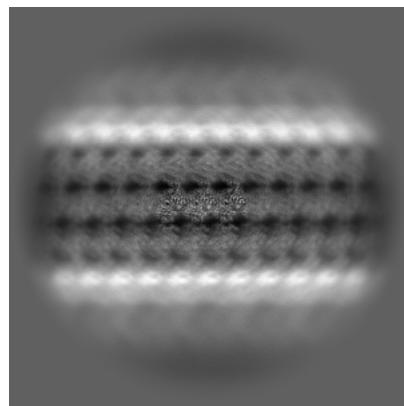
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections ⓘ
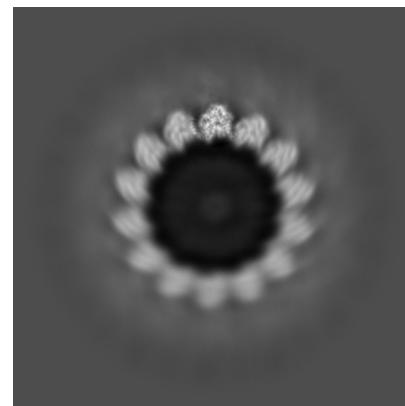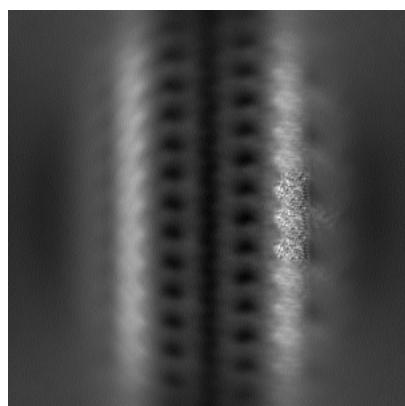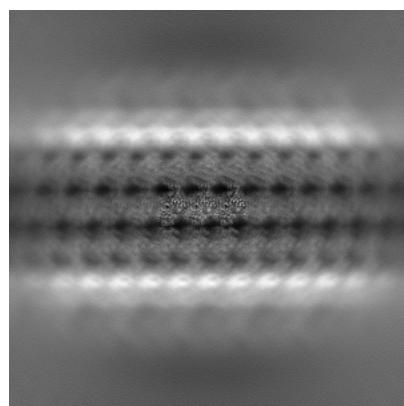
6.1.1 Primary map

| X | Y | Z |
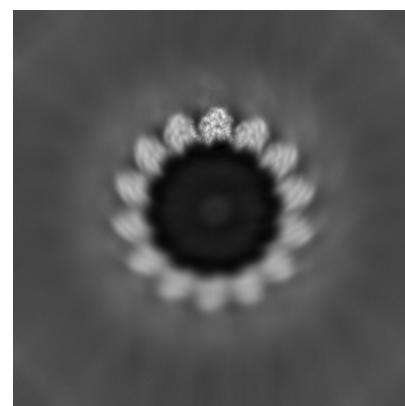
6.1.2 Raw map

| X | Y | Z |
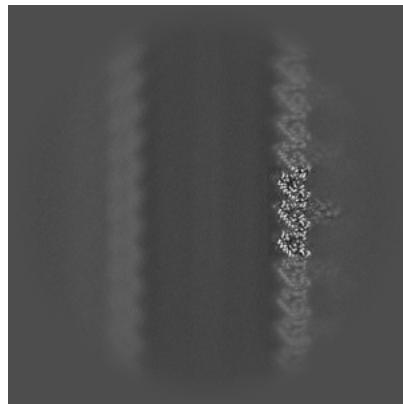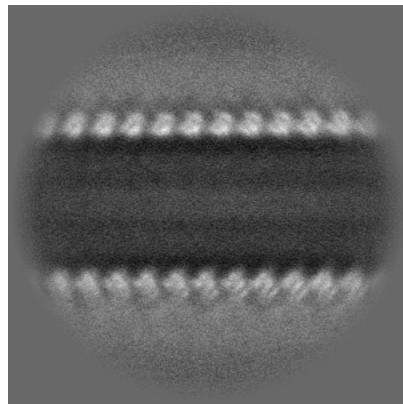
The images above show the map projected in three orthogonal directions.

6.2 Central slices ⓘ
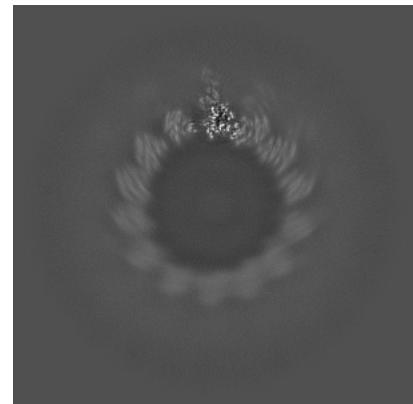
6.2.1 Primary map

X Index: 203
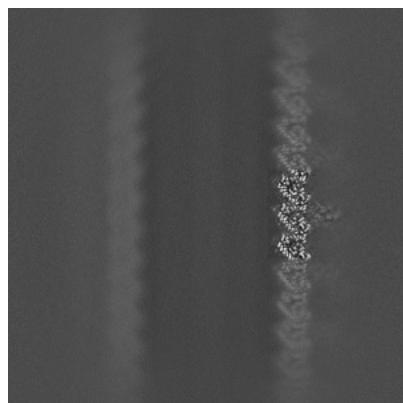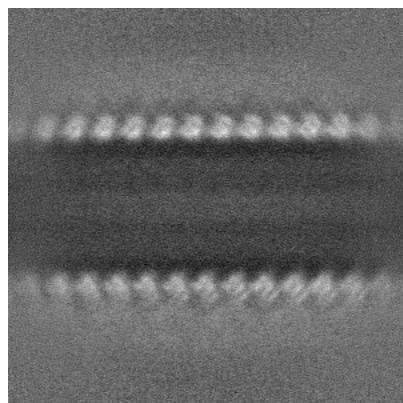
Y Index: 203
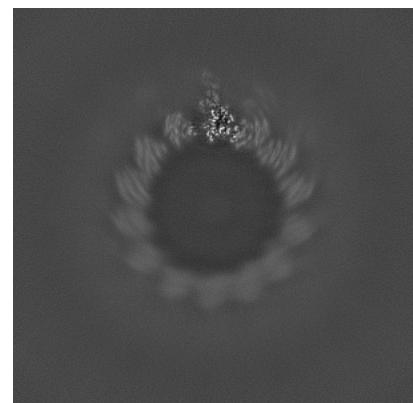
Z Index: 203

6.2.2 Raw map

X Index: 203

Y Index: 203
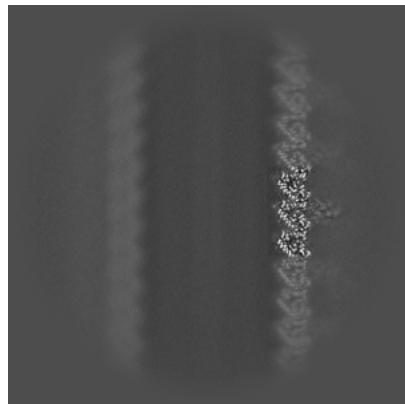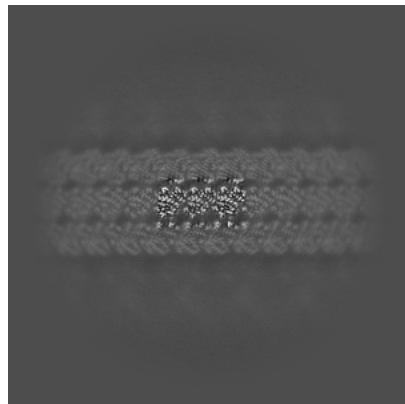
Z Index: 203

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

6.3 Largest variance slices (i)
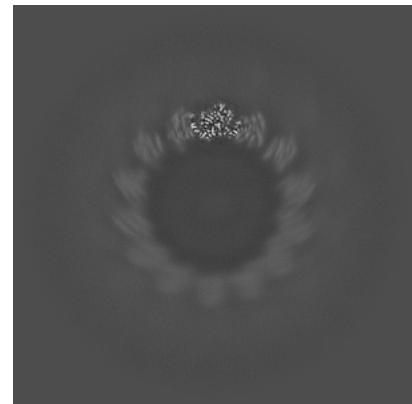
6.3.1 Primary map
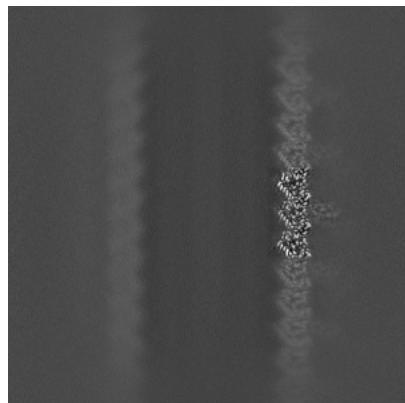
| X Index: 203 | Y Index: 282 | Z Index: 224 |
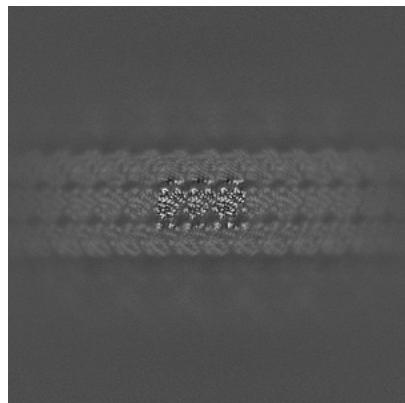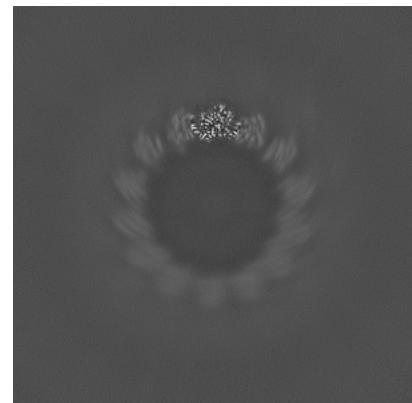
6.3.2 Raw map

| X Index: 204 | Y Index: 282 | Z Index: 224 |
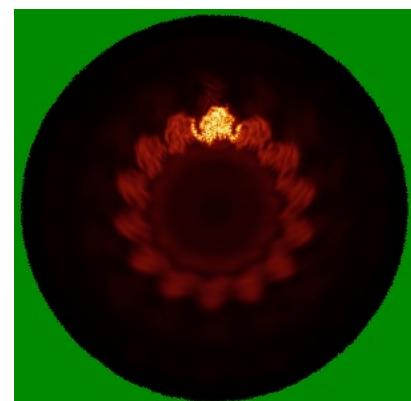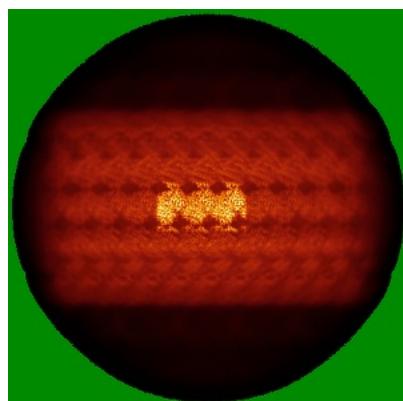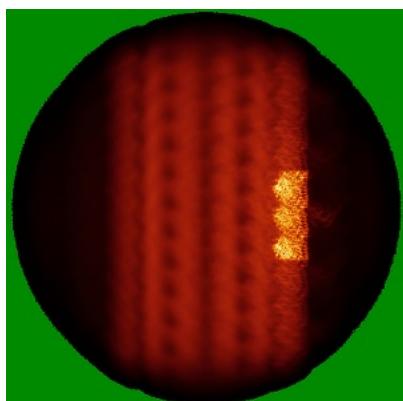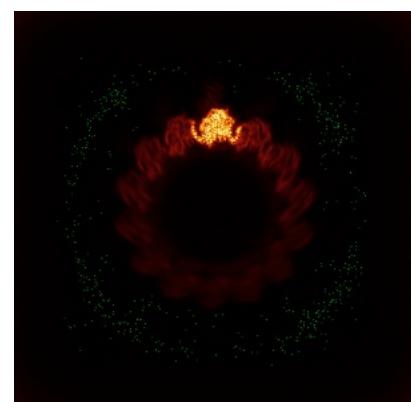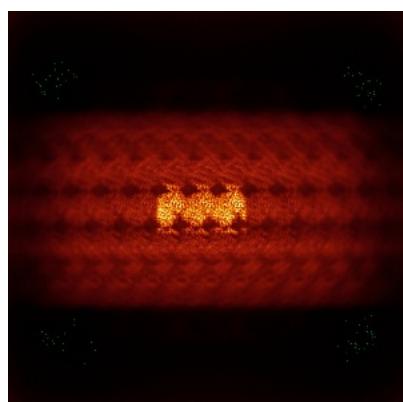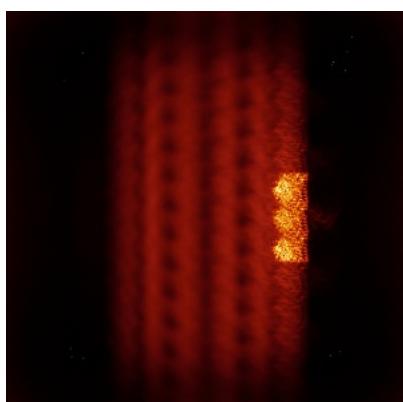
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map

| X | Y | Z |

6.4.2 Raw map

| X | Y | Z |
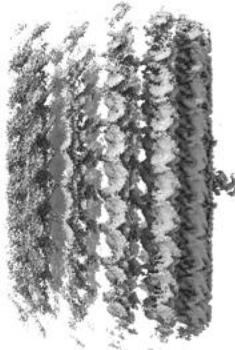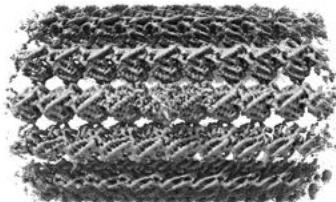
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views ⓘ
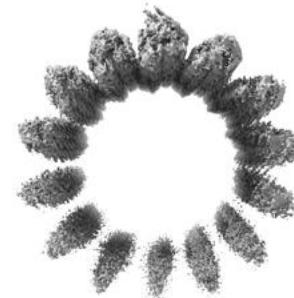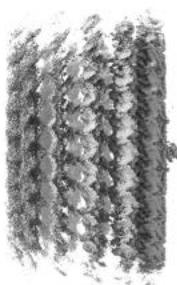
6.5.1 Primary map

X   Y   Z
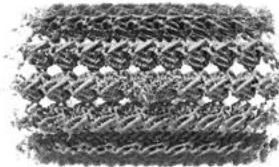
The images above show the 3D surface view of the map at the recommended contour level 0.121. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.
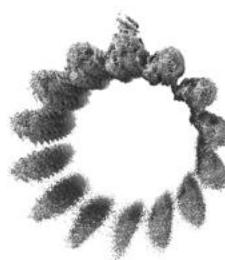
6.5.2 Raw map

X   Y   Z

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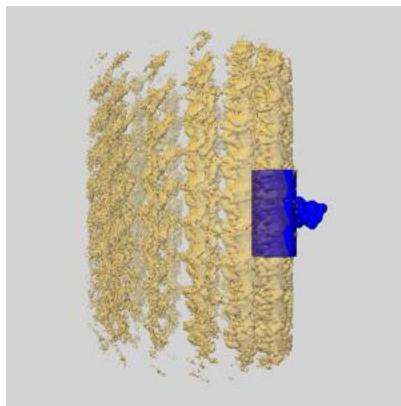
6.6　Mask visualisation ⓘ

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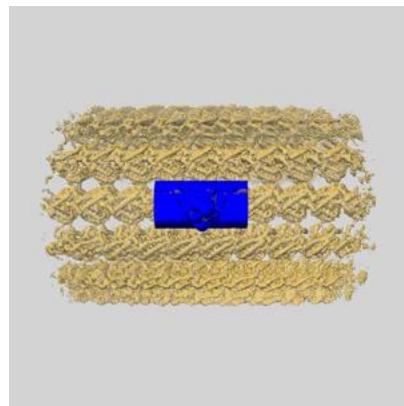
A mask typically either:

- Encompasses the whole structure

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

6.6.1　emd_46489_msk_1.map ⓘ

X　　　　　　　　　　　Y　　　　　　　　　　　Z
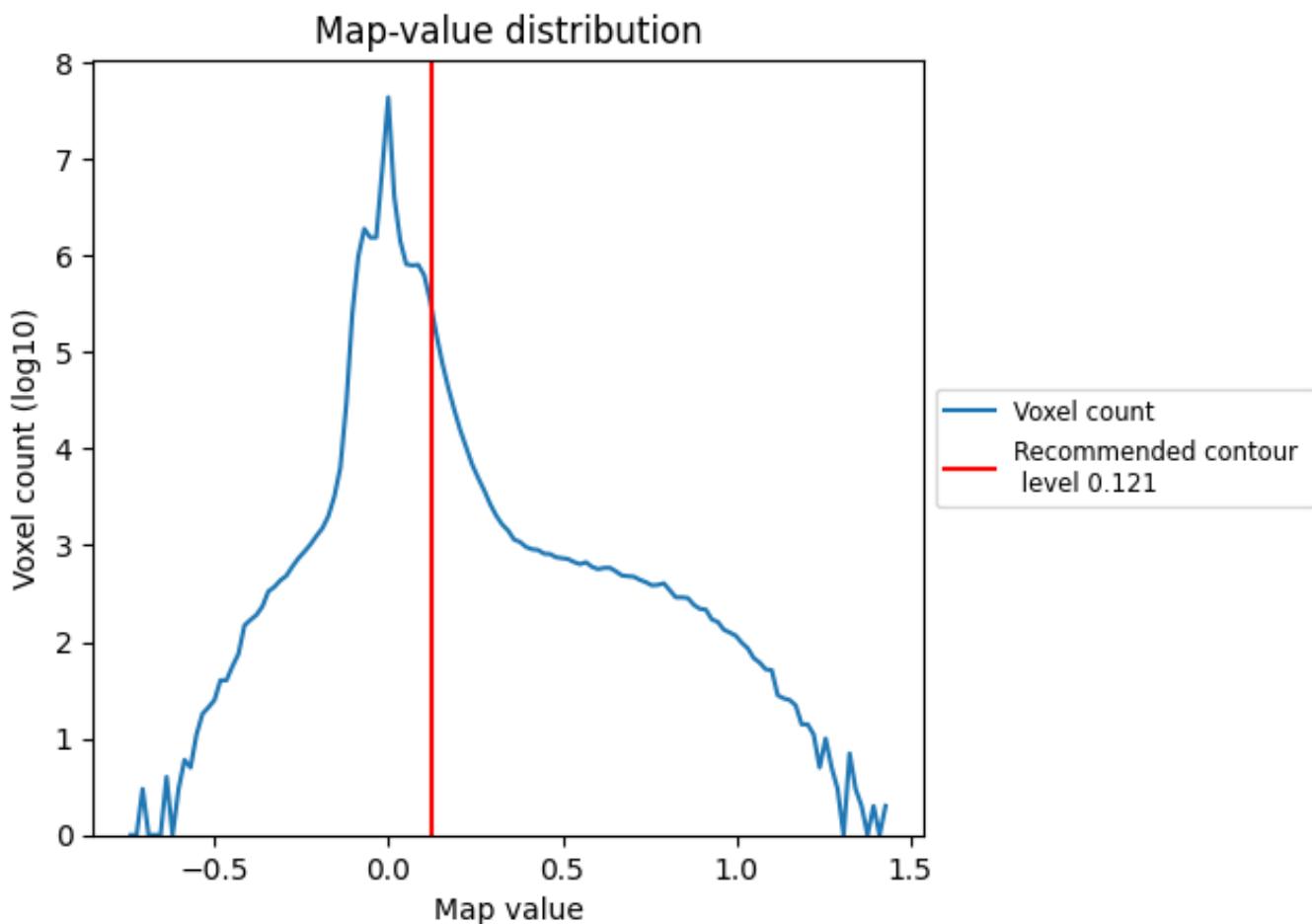
7 Map analysis ⓘ
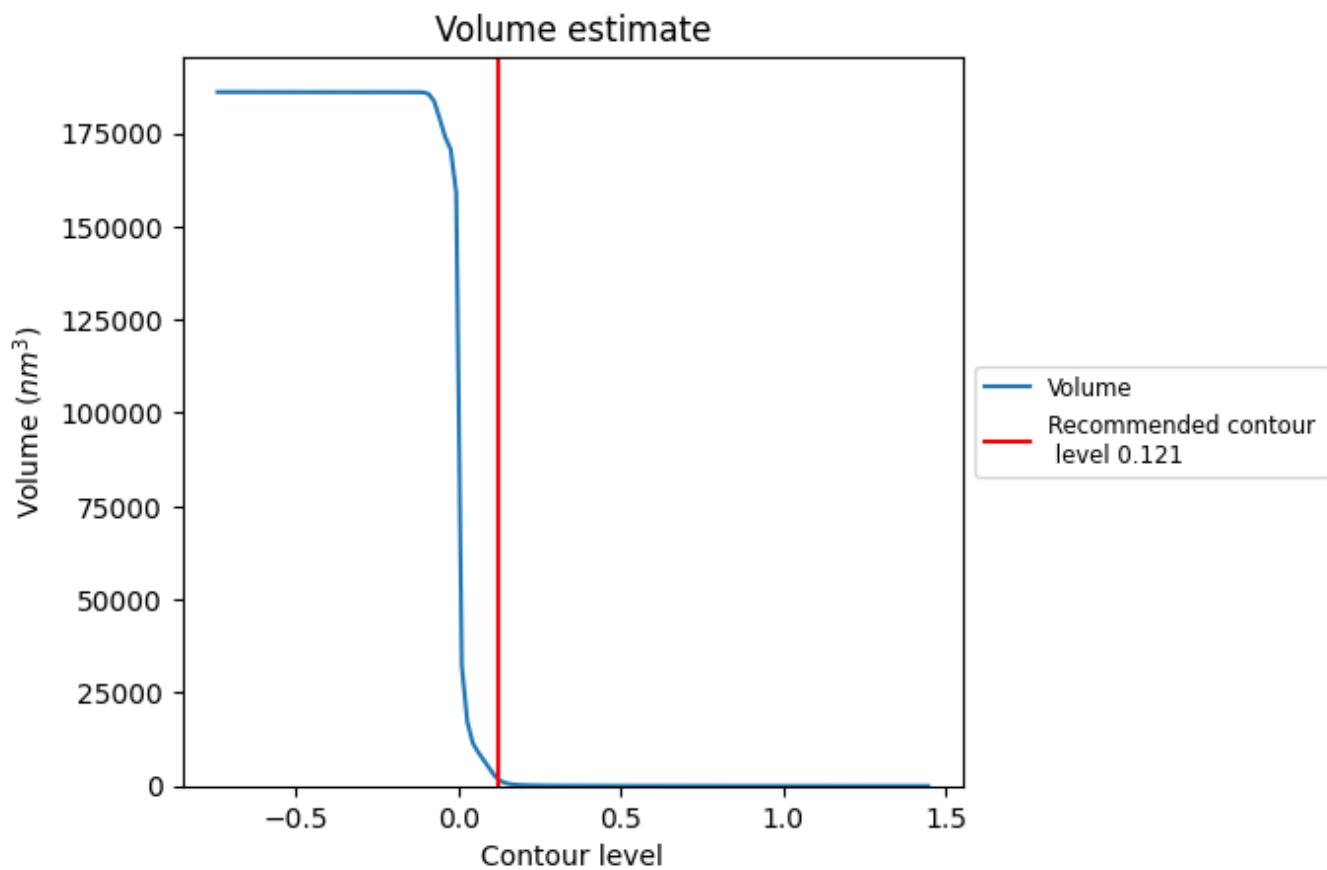
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution ⓘ

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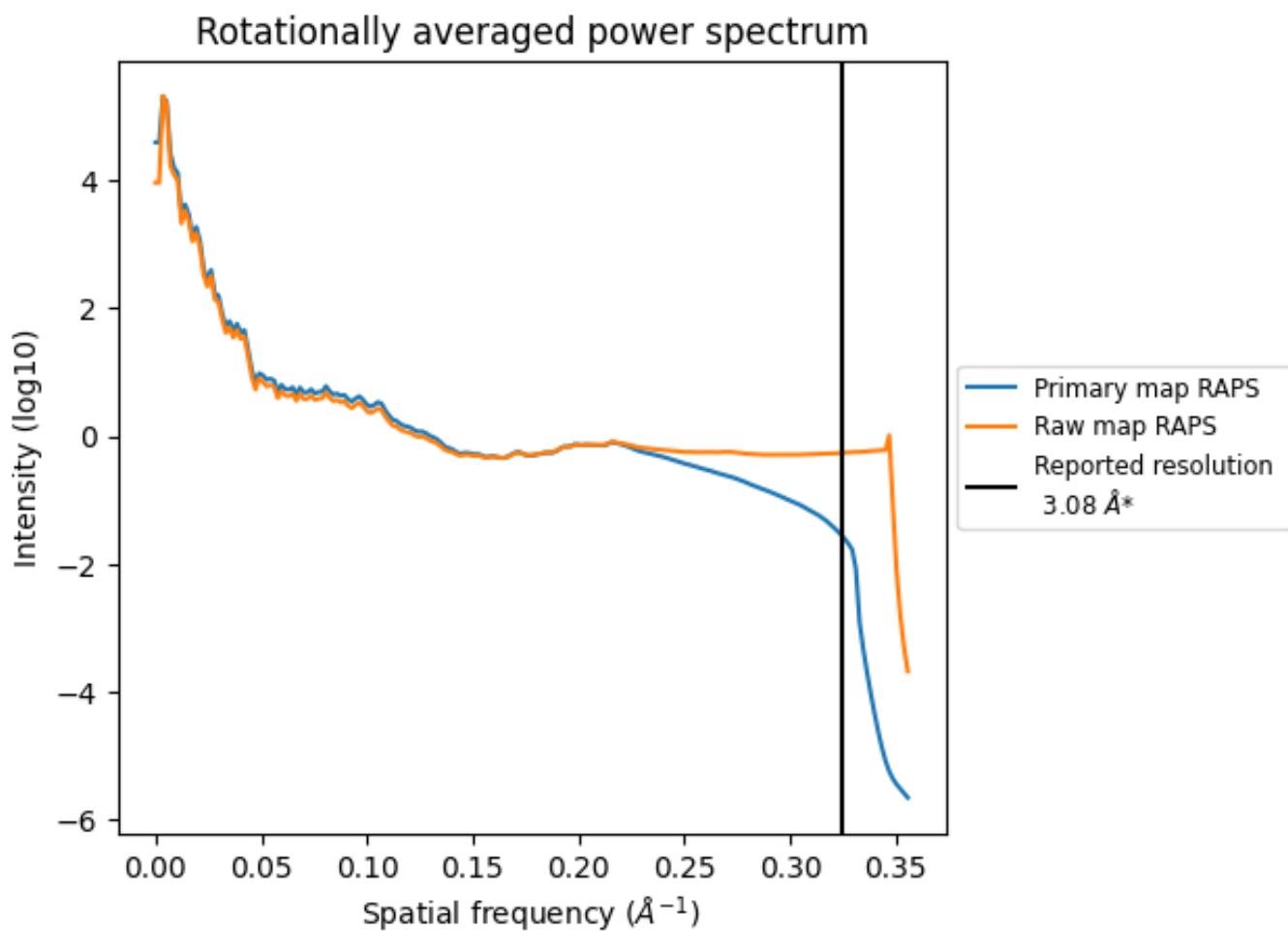
7.2 Volume estimate ⓘ

The volume at the recommended contour level is 1984 nm^3; this corresponds to an approximate mass of 1792 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 ⓘ
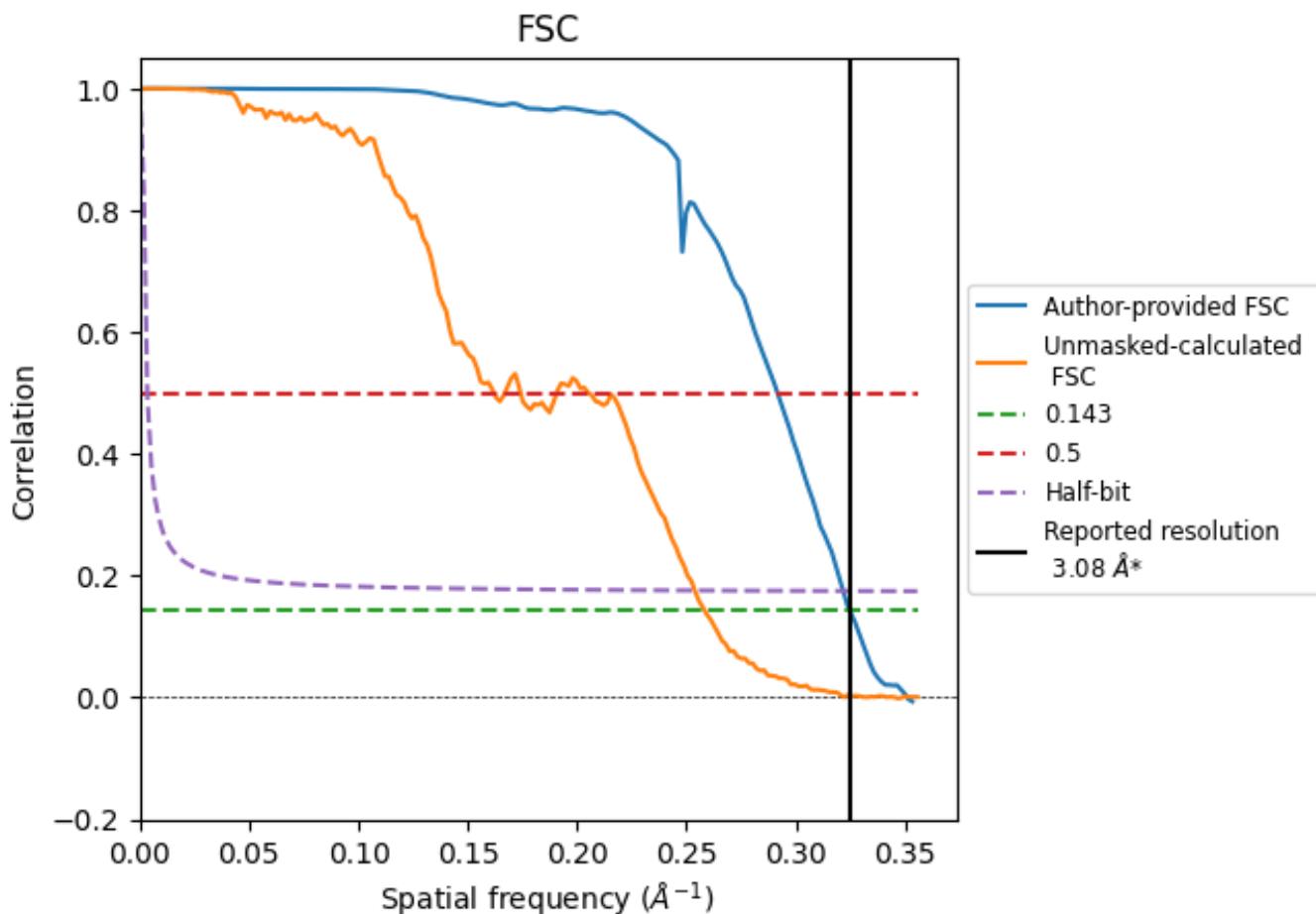
*Reported resolution corresponds to spatial frequency of 0.325 Å^{-1}

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 0.325 Å^{-1}

8.2   Resolution estimates ⓘ
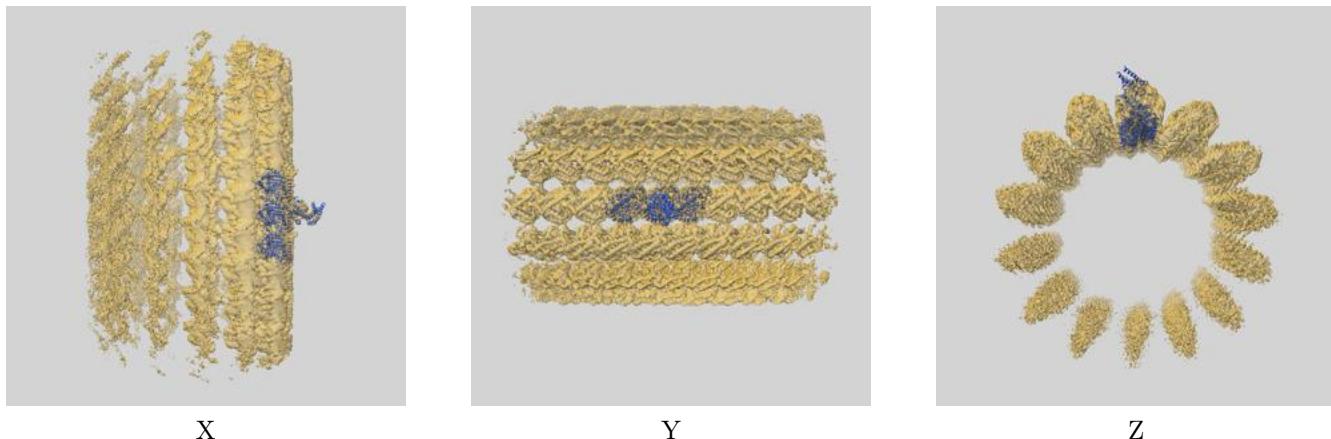
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.08	-	-
Author-provided FSC curve	3.08	3.43	3.11
Unmasked-calculated*	3.87	6.18	3.94

*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 3.87 differs from the reported value 3.08 by more than 10 %

9 Map-model fit ⓘ
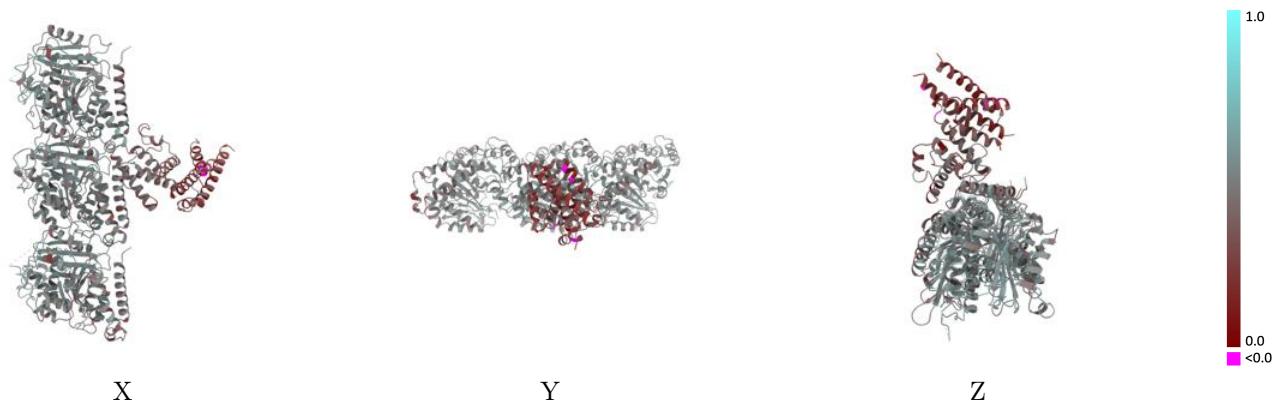
This section contains information regarding the fit between EMDB map EMD-46489 and PDB model 9D2B. Per-residue inclusion information can be found in section 3 on page 8.

9.1 Map-model overlay ⓘ

| X | Y | Z |
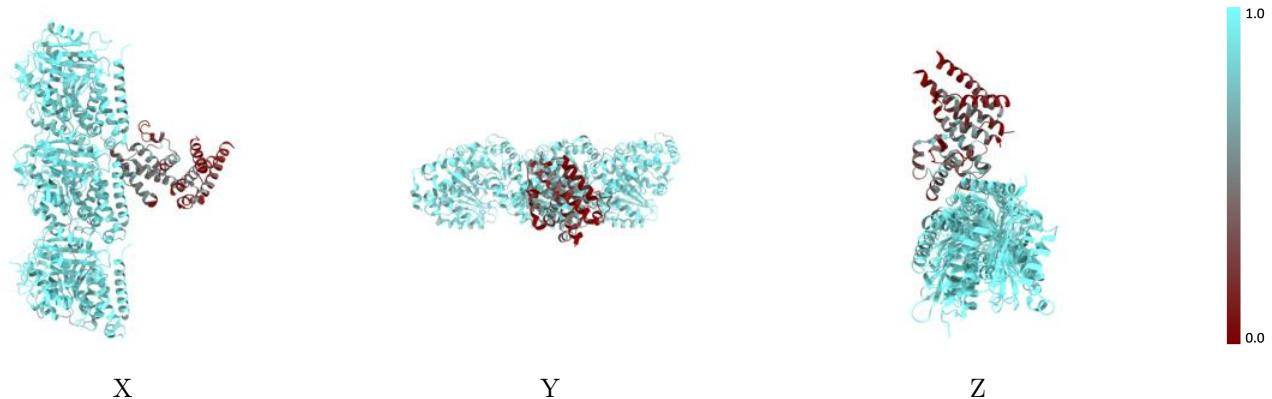
The images above show the 3D surface view of the map at the recommended contour level 0.121 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model ⓘ

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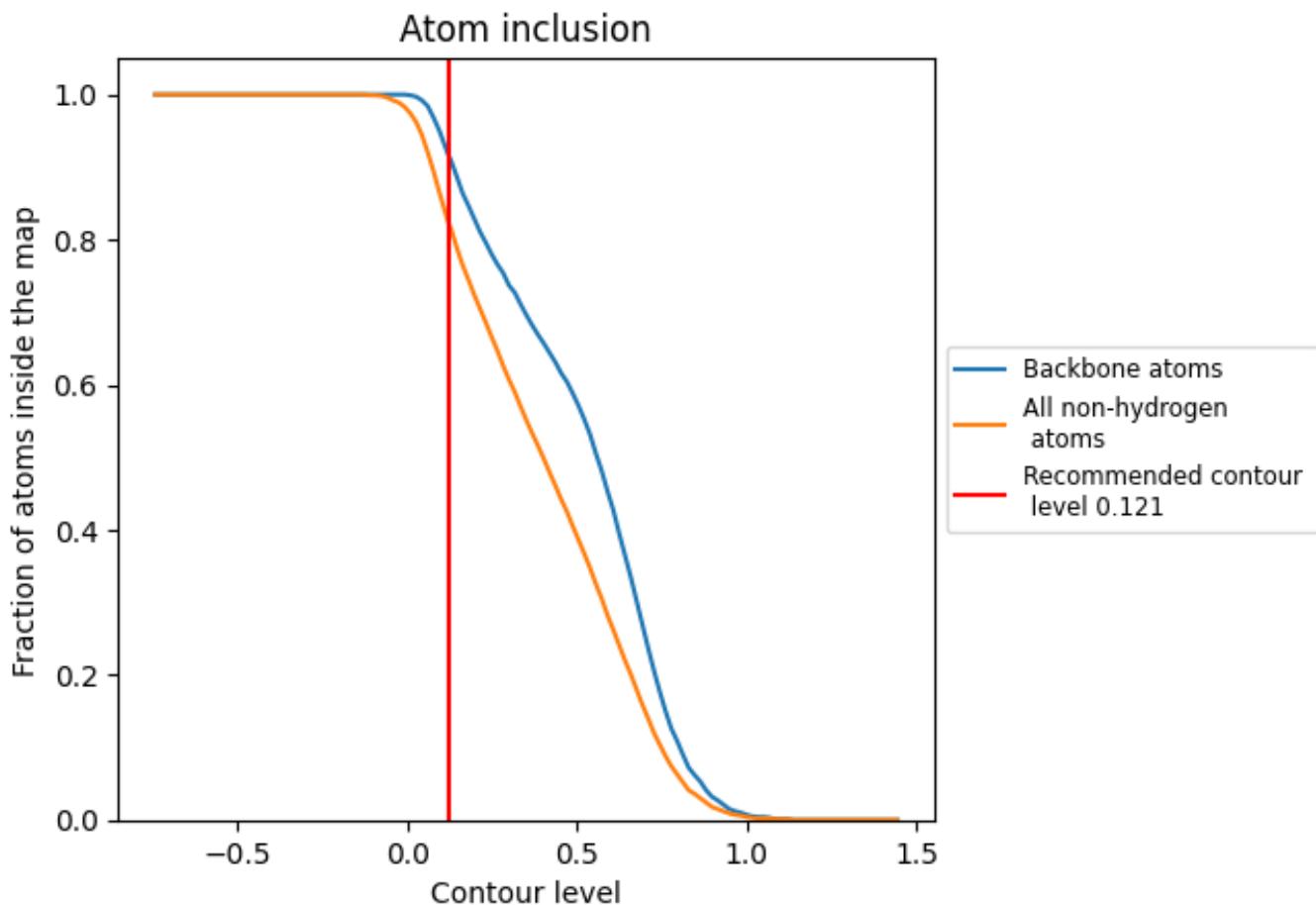
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

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 (0.121).

9.4 Atom inclusion ⓘ

At the recommended contour level, 92% of all backbone atoms, 82% 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 (0.121) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8250	0.4640
A	0.9270	0.5010
B	0.9150	0.4990
C	0.9140	0.4860
F	0.3620	0.3220
G	0.0460	0.1790
H	0.2880	0.2050

1.0

0.0
<0.0