wwPDB EM Validation Summary Report (i)

Jun 25, 2025 – 03:59 pm BST

PDB ID	:	8OVW / pdb_00008ovw
EMDB ID	:	EMD-17224
Title	:	Cryo-EM structure of CBF1-CCAN bound topologically to centromeric DNA
Authors	:	Dendooven, T.D.; Zhang, Z.; Yang, J.; McLaughlin, S.; Schwabb, J.; Scheres, S.; Yatskevich, S.; Barford, D.
Deposited on	:	2023-04-26
Resolution	:	3.40 Å(reported)

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

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

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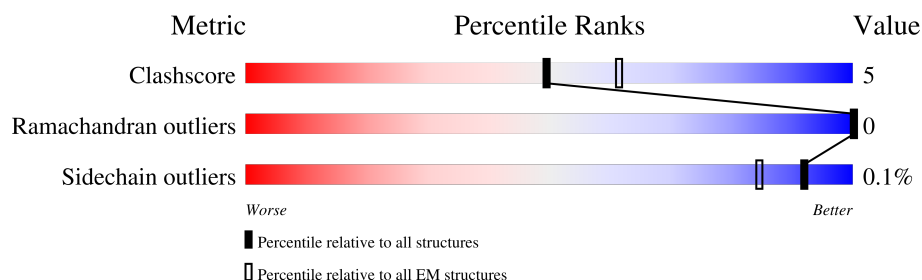http://www.wwpdb.org/validation/2017/FAQs#types.

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 3.40 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		5
Ramachandran outliers		0
Sidechain outliers		0.1%

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	351	7% — 26% · 71%
1	B	351	8% — 27% · 70%
2	D	153	5% — 17% · 82%
3	H	181	75% — 75% 20% 6%
4	I	733	62% — 77% 15% 7%
5	K	239	81% — 77% 15% 8%
6	L	245	13% — 80% 19% ·
7	N	458	16% — 72% 13% 15%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
8	O	368	19% 57% 9% 35%
9	P	369	8% 58% 11% 30%
10	Q	406	33% 56% 7% 36%
11	T	361	24% 20% 6% 75%
12	U	324	22% 48% 9% 43%
13	W	89	71% 72% 6% 22%
14	Y	238	45% 80% 14% 6%
15	Z	153	59% 92% 7%
16	E	153	5% 16% 82%

2 Entry composition ⓘ

There are 16 unique types of molecules in this entry. The entry contains 28461 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 Centromere-binding protein 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	101	Total 822	C 507	N 152	O 161	S 2	0	0
1	B	107	Total 876	C 542	N 161	O 171	S 2	0	0

- Molecule 2 is a DNA chain called C0N3 DNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	D	27	Total 553	C 262	N 101	O 163	P 27	0	0

- Molecule 3 is a protein called Inner kinetochore subunit MCM16.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	H	171	Total 1412	C 890	N 247	O 273	S 2	0	0

- Molecule 4 is a protein called Inner kinetochore subunit CTF3.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	I	679	Total 5496	C 3559	N 917	O 990	S 30	0	0

- Molecule 5 is a protein called Inner kinetochore subunit MCM22.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	K	219	Total 1762	C 1113	N 304	O 340	S 5	0	0

- Molecule 6 is a protein called Inner kinetochore subunit IML3.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	L	241	Total 1941	C 1244	N 320	O 366	S 11	0	0

- Molecule 7 is a protein called Inner kinetochore subunit CHL4.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	N	391	Total 3166	C 2053	N 537	O 563	S 13	0	0

- Molecule 8 is a protein called Inner kinetochore subunit MCM21.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	O	241	Total 1979	C 1277	N 328	O 369	S 5	0	0

- Molecule 9 is a protein called Inner kinetochore subunit CTF19.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	P	257	Total 2116	C 1358	N 366	O 378	S 14	0	0

- Molecule 10 is a protein called Inner kinetochore subunit OKP1.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	Q	258	Total 2144	C 1355	N 375	O 405	S 9	0	0

- Molecule 11 is a protein called Inner kinetochore subunit CNN1.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	T	92	Total 761	C 488	N 125	O 144	S 4	0	0

- Molecule 12 is a protein called Inner kinetochore subunit AME1.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	U	184	Total 1485	C 928	N 255	O 299	S 3	0	0

- Molecule 13 is a protein called Inner kinetochore subunit WIP1.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	W	69	Total 551	C 348	N 96	O 105	S 2	0	0

- Molecule 14 is a protein called Inner kinetochore subunit NKP1.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	Y	223	Total 1663	C 1027	N 281	O 349	S 6	0	0

- Molecule 15 is a protein called Inner kinetochore subunit NKP2.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	Z	151	Total 1180	C 740	N 204	O 235	S 1	0	0

- Molecule 16 is a DNA chain called C0N3 DNA.

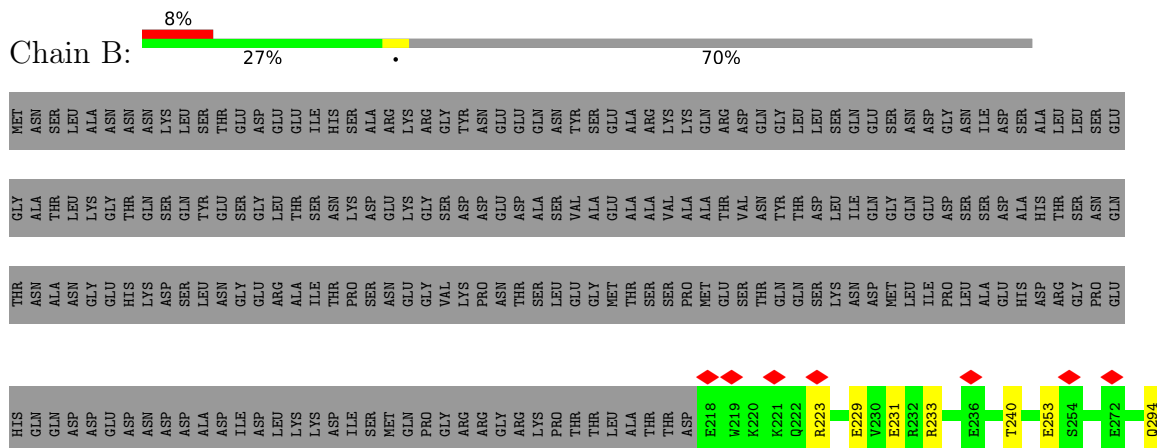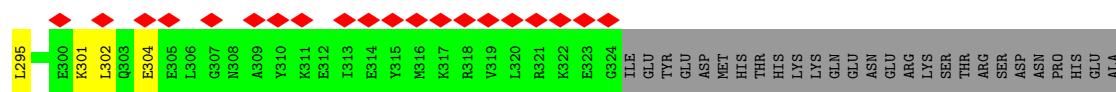| Mol	Chain	Residues	Atoms					AltConf	Trace
16	E	27	Total 554	C 262	N 104	O 161	P 27	0	0

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.
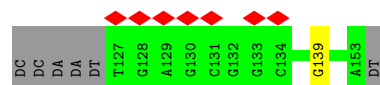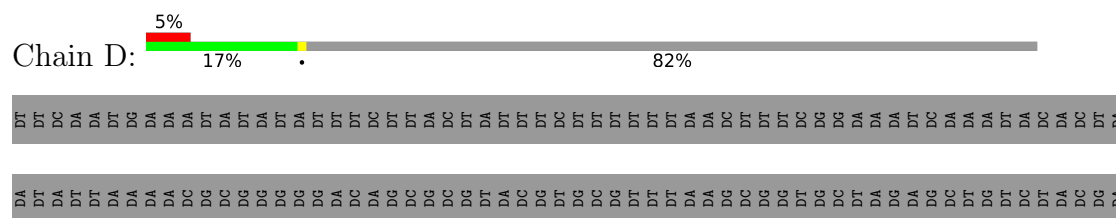
• Molecule 1: Centromere-binding protein 1

Chain A:

7%

26% · 71%

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

GLY ALA THR LEU LYS GLY THR GLN SER GLN TYR GLU SER GLY LEU THR SER ASN LYS ASP GLU LYS GLY SER ASP ASP GLU ASP ALA SER VAL ALA GLU ALA ALA VAL ALA THR VAL ASN TYR THR ASP LEU ILE GLN GLY GLU ASP SER SER ASP ALA HIS THR SER ASN GLN

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

HIS GLN GLN ASP ASP GLU ASP ASN ASP ASP ALA ASP ILE ASP LEU LYS LYS ASP ILE SER MET GLN PRO GLY ARG ARG GLY ARG LYS PRO THR THR LEU ALA THR THR ASP GLU TRP LYS **K221 Q222 R223 K224 D225 S226 H227** R232 R233 E236 D247 R252 E253 S254 D274

E275 I278 E279 L283 Q290 Q294 L295 E300 K301 L302 Q303 E304 E305 L306 G307 K311 E314 Y315 M316 K317 R318 V319 L320 R321 LYS GLU GLY ILE GLU GLU TYR GLU ASP MET HIS THR HIS LYS LYS GLN GLY ASN GLU ARG LYS SER THR ARG SER ASP ASN PRO HIS GLU

ALA

• Molecule 1: Centromere-binding protein 1

Chain B:

8%

27% · 70%

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

GLY ALA THR LEU LYS GLY THR GLN SER GLN TYR GLU SER GLY LEU THR SER ASN LYS ASP GLU LYS GLY SER ASP ASP GLU ASP ALA SER VAL ALA GLU ALA ALA VAL ALA THR VAL ASN TYR THR ASP LEU ILE GLN GLY GLU ASP SER SER ASP ALA HIS THR SER ASN GLN

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

HIS GLN GLN ASP ASP GLU ASP ASN ASP ASP ALA ASP ILE ASP LEU LYS LYS ASP ILE SER MET GLN PRO GLY ARG ARG GLY ARG LYS PRO THR THR LEU ALA THR THR ASP **E218 W219 K220** K221 Q222 R223 E229 V230 E231 R232 R233 E236 T240 E263 S254 E272 Q294

L295 E300 K301 L302 Q303 E304 E305 L306 G307 N308 A309 Y310 K311 E312 I313 E314 Y315 M316 K317 R318 V319 L320 R321 K322 E323 G324 ILE GLU TYR GLU ASP MET HIS THR HIS LYS LYS GLN GLU ASN GLU ARG LYS SER THR ARG ASP ASN PRO HIS GLU ALA

• Molecule 2: C0N3 DNA

Chain D:

5%
17% • 82%

DT DT DC DA DA DT DG DA DA DA DT DA DT DA DT DT DT DT DC DT DA DC DT DA DT DT DT DT DT DT DT DC DT DT DT DA DC DT DT DT DC DG DG DA DA DT DA DA DT DT DA DC DA DA DT DA DC DC DT DA

DA DT DA DT DA DA DA DA DC DC DC DG DG DG DA DA DC DA DG DC DT DA DC DG DT DC DG DT DT DC DA DA DG DC DG DT DT DA DA DG DC DT DG DC DT DG DC DT DA DC DA

DC DC DA DT T127 G128 A129 G130 C131 G132 G133 C134 G139 A153 DT

• Molecule 3: Inner kinetochore subunit MCM16

Chain H:

75%
75% 20% 6%

MET THR ASN S4 S5 E6 K7 Q8 W9 E10 R11 I12 Q13 Q14 L15 E16 K17 E18 H19 R24 E25 L26 L27 I28 T29 L30 D31 R32 L33 Y34 L35 I36 R37 K38 H39 N40 H41 A42 V43 I44 L45 S46 H47 Q50 R51 L52 L53 E54 I55 R56 H57 Q58 L59 Q60 I61 N62 L63 E64

K65 T66 A67 L68 L69 I70 R71 L72 L73 E74 K75 P76 D77 N78 T79 N80 V81 L82 F83 T84 K85 L86 Q87 N88 L89 L90 E91 E92 S93 N94 S95 L96 D97 Y98 E99 L100 L101 Q102 S103 L104 G105 A106 Q107 L114 R118 A119 E120 R121 D122 E123 L124 M125 S126 K127 L128 I129 E130 L131

S132 S133 K134 K137 P138 T139 ILE PRO PRO ASP ASP ASP T147 A148 G149 K150 Q151 V152 E153 V154 E155 K156 E157 N158 E159 T160 I161 Q162 E163 L164 M165 I166 A167 L168 Q169 I170 H171 S172 G173 Y174 I175 N176 I177 S178 Y179 T180 I181

• Molecule 4: Inner kinetochore subunit CTF3

Chain I:

62%
77% 15% 7%

MET S2 L3 I4 L5 D6 D7 I8 I9 L10 S11 L12 T13 ASN ALA ASN GLU ARG THR PRO GLN ALA LEU K25 T26 T27 L28 S29 L30 L31 Y32 E33 K34 S35 K36 Q37 Y38 G39 L40 S41 S42 P43 Q44 L45 Q46 A47 L48 V49 R50 L51 L52 C53 E54 T55 S56 I57 I58 D59 T60

V61 T62 K63 V64 Y65 I66 V67 E68 N69 C70 F71 L72 P73 D74 G75 Y76 L77 T78 K79 E80 L81 L82 L83 E84 I85 I86 N87 H88 L89 G90 T91 P92 T93 V94 F95 S96 R97 Y98 R99 I100 Q101 T102 P103 P104 V105 L106 Q107 S108 A109 L110 C111 K112 W113 L114 V115 H116 V117 TYR PHE LEU

PHE PRO VAL HIS SER GLU ARG GLU HIS N130 I131 S132 S133 S134 I135 W136 L139 F142 S143 F144 L145 Q146 K147 W148 I149 T150 P151 L152 T158 V161 D162 V163 K164 L168 K172 R173 C174 A175 M176 G179 Y180 R181 D182 G185 S186 A187 I190 L191 Q192 R193 F194

Q195 C196 L197 V198 G199 A200 S201 S202 Q203 I204 T205 E206 S207 I208 I209 N212 C213 N214 R215 K216 T217 L218 K219 S220 H221 R222 N223 L224 K225 L226 D227 A228 H229 F230 L231 S232 I233 L234 K235 R236 I237 L238 S239 R240 A241 H242 P243 A244 N245 F246 P247 A248 D249 T250 V251 Q252 N253 T254 I255

• Molecule 5: Inner kinetochore subunit MCM22

Chain K:

• Molecule 6: Inner kinetochore subunit IML3

Chain L:

- Molecule 7: Inner kinetochore subunit CHL4
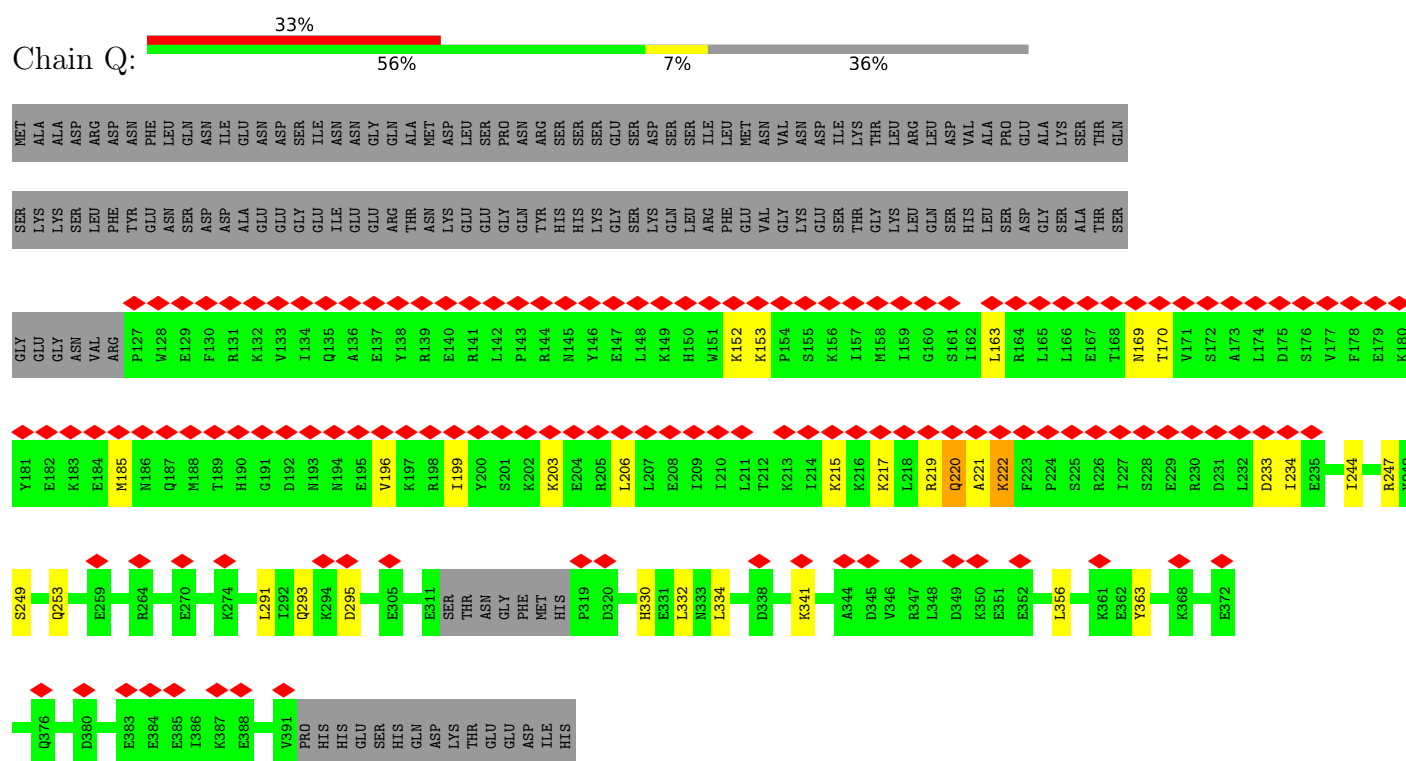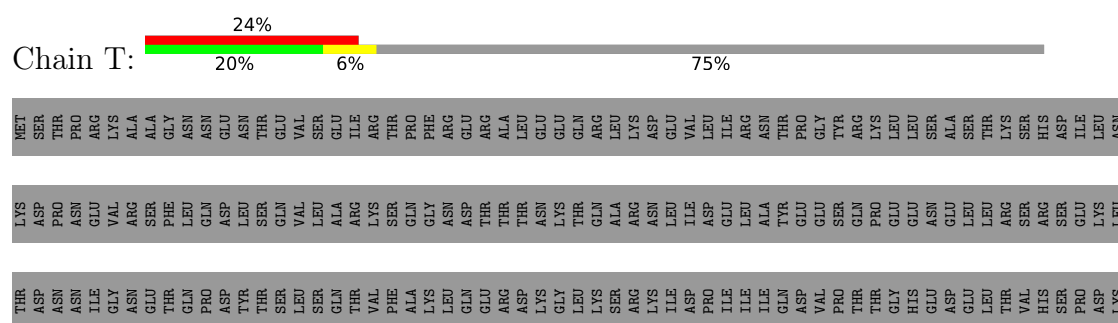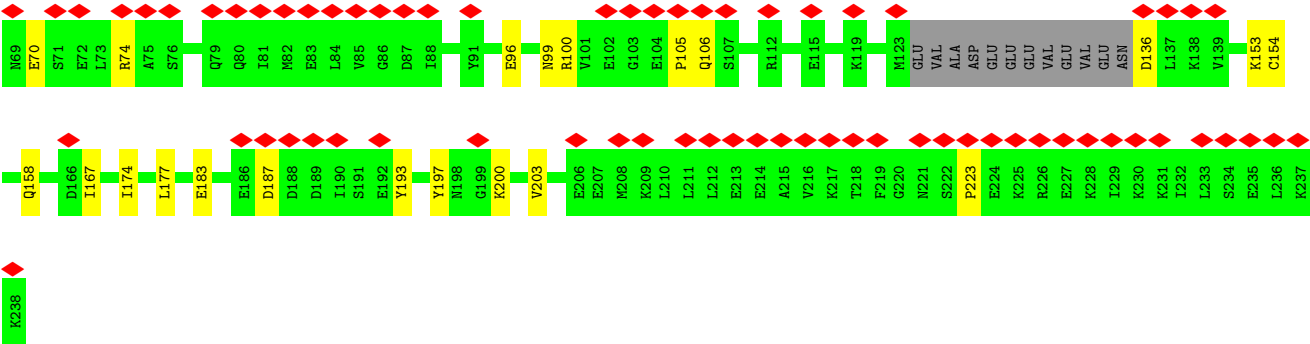

- Molecule 8: Inner kinetochore subunit MCM21
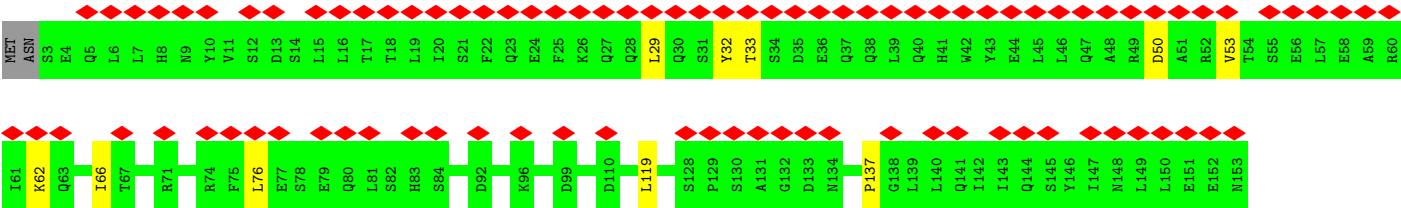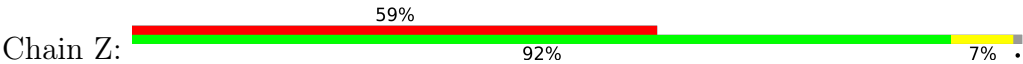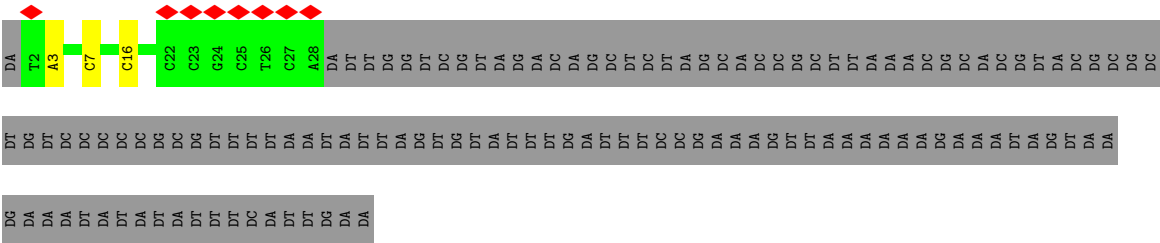

- Molecule 9: Inner kinetochore subunit CTF19

Chain P:

8%
58% 11% 30%

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

LYS ASP ALA LEU LEU THR ARG ARG ASN THR LEU LEU GLU GLN ILE GLU THR THR TYR GLN ASN ILE LEU MET LYS GLU ASN ASN SER LYS THR LYS ASN GLY ILE LEU GLN N98 D99 I100 T101 Q102 D103 F104 L105 N106 L107 I108 S109 I110 S111 S112 SER ASN PRO ASN SER ALA ILE SER

ASP ARG LYS R124 I128 L134 Q135 L138 L148 R153 L157 Q166 D173 H176 N177 D178 G179 I180 E181 C190 M194 Y205 K206 D209 S210 L213 I217 I220 R225 K229 L232 R235 Q238 K254 I257 F258 Q259

T269 N276 S277 D278 S279 L280 I281 V282 E283 R284 R287 E288 G289 R290 L296 Q297 I298 N299 F300 E307 R308 GLY LYS PRO ARG N313 I321 S322 I323 K327 E339 K351 L362 F363 P364 D365 A368 R369

• Molecule 10: Inner kinetochore subunit OKP1

Chain Q:

33%
56% 7% 36%

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

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

GLY GLU GLY ASN VAL ARG P127 W128 E129 F130 R131 K132 V133 I134 Q135 A136 E137 Y138 R139 E140 R141 L142 P143 R144 N145 Y146 E147 L148 K149 H150 W151 K152 K153 P154 S155 K156 I157 M158 I159 G160 S161 I162 L163 R164 L165 L166 E167 T168 N169 T170 V171 S172 A173 L174 D175 S176 V177 F178 E179 K180

Y181 E182 K183 E184 M185 N186 Q187 M188 T189 H190 G191 D192 N193 N194 E195 V196 K197 R198 I199 Y200 S201 K202 K203 E204 R205 L206 L207 E208 I209 I210 L211 T212 K213 I214 K215 K216 K217 L218 R219 Q220 A221 K222 F223 P224 S225 R226 I227 S228 E229 R230 D231 L232 D233 I234 E235 I244 R247 Y248

S249 Q253 E259 R264 E270 K274 L291 I292 Q293 K294 D295 E305 E311 SER THR ASN GLY MET HIS P319 D320 H330 E331 L332 N333 L334 D338 K341 A344 D345 V346 R347 L348 D349 K350 E351 E352 L356 K361 E362 Y363 K368 E372

Q376 D380 E383 E384 E385 I386 K387 E388 V391 PRO HIS HIS GLU LEU SER HIS GLN ASP LYS SER THR GLU GLU ASP ILE HIS

• Molecule 11: Inner kinetochore subunit CNN1

Chain T:

24%
20% 6% 75%

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

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

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

• Molecule 12: Inner kinetochore subunit AME1

Chain U:

22%

48%　　9%　　43%

• Molecule 13: Inner kinetochore subunit WIP1

Chain W:

71%

72%　　6%　　22%

• Molecule 14: Inner kinetochore subunit NKP1

Chain Y:

45%

80%　　14%　6%

N69 E70 S71 E72 L73 R74 A75 S76 Q79 Q80 I81 M82 E83 L84 V85 G86 D87 I88 Y91 E96 N99 R100 V101 E102 G103 E104 P105 Q106 S107 R112 E115 K119 M123 GLU VAL ALA ASP GLU GLU GLU VAL GLU VAL GLU ASN D136 L137 K138 V139 K153 C154

Q158 D166 I167 I174 L177 E183 E186 D187 D188 D189 I190 S191 E192 Y193 Y197 N198 G199 K200 V203 E206 E207 M208 K209 L210 L211 L212 E213 E214 A215 V216 K217 T218 F219 G220 N221 S222 P223 E224 K225 R226 E227 K228 I229 K230 K231 I232 L233 S234 E235 L236 K237

K238

• Molecule 15: Inner kinetochore subunit NKP2

Chain Z:

59%

92%   7%   •

MET ASN S3 E4 Q5 L6 L7 H8 N9 Y10 V11 S12 D13 S14 L15 L16 T17 T18 L19 I20 S21 F22 Q23 E24 F25 K26 Q27 Q28 L29 Q30 S31 Y32 T33 S34 D35 E36 Q37 Q38 L39 Q40 H41 W42 Y43 E44 L45 L46 Q47 A48 R49 D50 A51 R52 V53 T54 S55 E56 L57 E58 A59 R60

I61 K62 Q63 I66 T67 R71 R74 F75 L76 E77 S78 E79 Q80 L81 S82 H83 S84 D92 K96 D99 D110 L119 S128 P129 S130 A131 G132 D133 N134 P137 G138 L139 L140 Q141 I142 I143 Q144 S145 Y146 I147 N148 L149 L150 E151 E152 N153

• Molecule 16: C0N3 DNA

Chain E:

5%

16%   •   82%

DA T2 A3 C7 C16 C22 C23 G24 C25 T26 C27 A28 DA DT DT DG DG DT DC DG DT DA DG DA DC DA DG DC DT DC DT DA DG DC DT DA DA DA DC DG DC DA DC DT DA DG DG DC DC

DT DG DT DC DC DG DC DG DG DT DT DA DA DT DA DT DA DG DG DG DT DA DT DT DG DT DC DC DG DA DA DG DT DA DA DA DA DG DA DA DT DA DG DT DA DA

DG DA DA DA DT DA DT DA DT DT DT DC DA DT DT DG DA DA

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	43467	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 $(e^-/Å^2)$	40	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2600	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.148	Depositor
Minimum map value	-0.090	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.005	Depositor
Recommended contour level	0.0354	Depositor
Map size (Å)	327.88, 327.88, 327.88	wwPDB
Map dimensions	280, 280, 280	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.171, 1.171, 1.171	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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	0.18	0/828	0.38	0/1108
1	B	0.18	0/884	0.41	0/1182
2	D	0.19	0/619	0.35	0/953
3	H	0.21	0/1429	0.53	1/1923 (0.1%)
4	I	0.18	0/5620	0.45	0/7623
5	K	0.19	0/1784	0.46	0/2404
6	L	0.17	0/1981	0.46	0/2684
7	N	0.18	0/3239	0.48	0/4372
8	O	0.17	0/2017	0.42	0/2713
9	P	0.19	0/2149	0.43	0/2888
10	Q	0.23	0/2175	0.42	0/2913
11	T	0.18	0/772	0.48	0/1040
12	U	0.26	0/1499	0.52	0/2018
13	W	0.18	0/557	0.41	0/748
14	Y	0.22	0/1672	0.55	2/2252 (0.1%)
15	Z	0.17	0/1195	0.46	1/1616 (0.1%)
16	E	0.20	0/621	0.34	0/956
All	All	0.19	0/29041	0.46	4/39393 (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
4	I	0	3
9	P	0	1
10	Q	0	1
12	U	0	1
14	Y	0	1
All	All	0	7

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
14	Y	223	PRO	N-CA-CB	5.90	110.05	103.44
15	Z	137	PRO	N-CA-CB	5.87	110.02	103.44
14	Y	45	GLN	N-CA-CB	5.21	118.32	110.30
3	H	14	GLN	N-CA-CB	5.08	118.15	110.28

There are no chirality outliers.

5 of 7 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
4	I	201	SER	Peptide
4	I	202	SER	Peptide
4	I	241	ALA	Peptide
9	P	307	GLU	Peptide
10	Q	219	ARG	Mainchain

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	822	0	845	7	0
1	B	876	0	896	10	0
2	D	553	0	304	1	0
3	H	1412	0	1451	36	0
4	I	5496	0	5615	82	0
5	K	1762	0	1796	32	0
6	L	1941	0	1946	32	0
7	N	3166	0	3220	42	0
8	O	1979	0	1995	25	0
9	P	2116	0	2189	30	0
10	Q	2144	0	2195	24	0
11	T	761	0	781	16	0
12	U	1485	0	1467	27	0
13	W	551	0	559	3	0
14	Y	1663	0	1588	25	0
15	Z	1180	0	1108	7	0
16	E	554	0	303	3	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	28461	0	28258	309	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 5.

The worst 5 of 309 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)
4:I:510:MET:HE2	5:K:89:TRP:CH2	1.96	1.00
3:H:121:ARG:HH22	5:K:110:ILE:HG23	1.46	0.81
4:I:510:MET:HE2	5:K:89:TRP:CZ2	2.23	0.73
7:N:61:LEU:HD11	7:N:74:ARG:NH1	2.03	0.73
4:I:150:THR:HG21	4:I:186:SER:HB2	1.75	0.69

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	99/351 (28%)	98 (99%)	1 (1%)	0	100	100
1	B	105/351 (30%)	104 (99%)	1 (1%)	0	100	100
3	H	167/181 (92%)	163 (98%)	4 (2%)	0	100	100
4	I	669/733 (91%)	642 (96%)	27 (4%)	0	100	100
5	K	213/239 (89%)	211 (99%)	2 (1%)	0	100	100
6	L	239/245 (98%)	234 (98%)	5 (2%)	0	100	100
7	N	383/458 (84%)	368 (96%)	15 (4%)	0	100	100
8	O	237/368 (64%)	224 (94%)	13 (6%)	0	100	100
9	P	251/369 (68%)	239 (95%)	12 (5%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
10	Q	254/406 (63%)	252 (99%)	2 (1%)	0	100	100
11	T	90/361 (25%)	87 (97%)	3 (3%)	0	100	100
12	U	180/324 (56%)	173 (96%)	7 (4%)	0	100	100
13	W	65/89 (73%)	65 (100%)	0	0	100	100
14	Y	217/238 (91%)	208 (96%)	9 (4%)	0	100	100
15	Z	149/153 (97%)	146 (98%)	3 (2%)	0	100	100
All	All	3318/4866 (68%)	3214 (97%)	104 (3%)	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	89/305 (29%)	89 (100%)	0	100	100
1	B	94/305 (31%)	94 (100%)	0	100	100
3	H	162/172 (94%)	162 (100%)	0	100	100
4	I	631/683 (92%)	631 (100%)	0	100	100
5	K	202/223 (91%)	202 (100%)	0	100	100
6	L	217/221 (98%)	217 (100%)	0	100	100
7	N	353/416 (85%)	353 (100%)	0	100	100
8	O	226/347 (65%)	226 (100%)	0	100	100
9	P	241/344 (70%)	241 (100%)	0	100	100
10	Q	242/378 (64%)	240 (99%)	2 (1%)	79	87
11	T	89/339 (26%)	89 (100%)	0	100	100
12	U	168/308 (54%)	166 (99%)	2 (1%)	67	80
13	W	57/76 (75%)	57 (100%)	0	100	100
14	Y	175/219 (80%)	175 (100%)	0	100	100
15	Z	121/143 (85%)	121 (100%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	3067/4479 (68%)	3063 (100%)	4 (0%)	92 97

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

Mol	Chain	Res	Type
10	Q	220	GLN
10	Q	222	LYS
12	U	164	ASP
12	U	165	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 28 such sidechains are listed below:

Mol	Chain	Res	Type
8	O	122	GLN
15	Z	102	GLN
9	P	297	GLN
14	Y	14	ASN
9	P	259	GLN

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 ⓘ

There are no ligands in this entry.

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-17224. 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 ⓘ
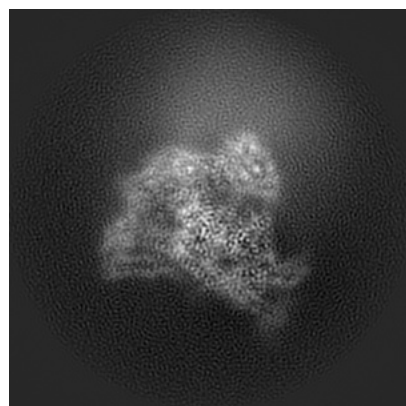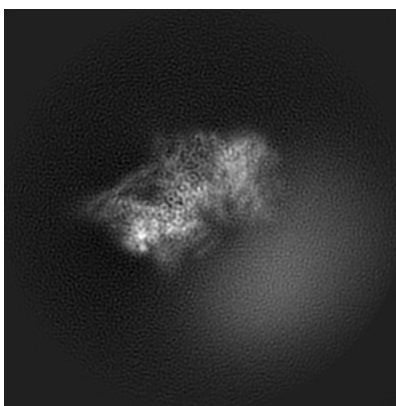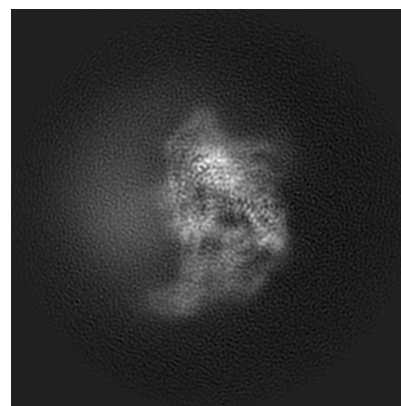
6.1.1 Primary map

X Y Z

6.1.2 Raw map

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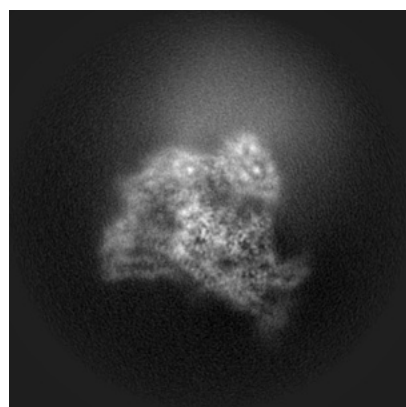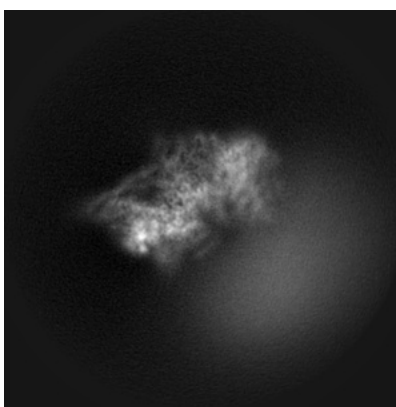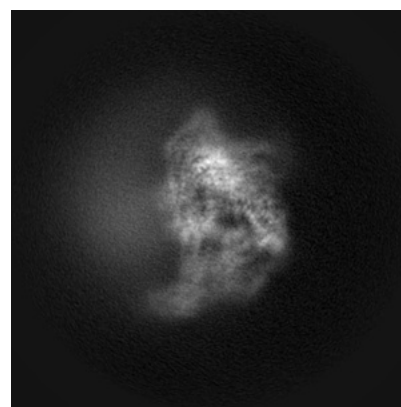
The images above show the map projected in three orthogonal directions.

6.2 Central slices ⓘ
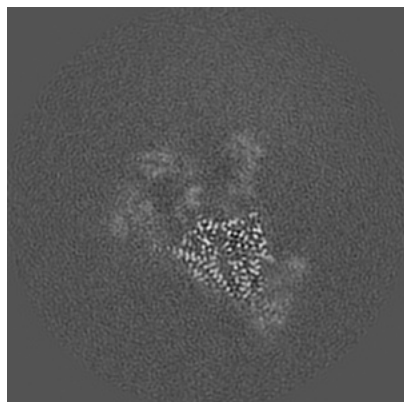
6.2.1 Primary map
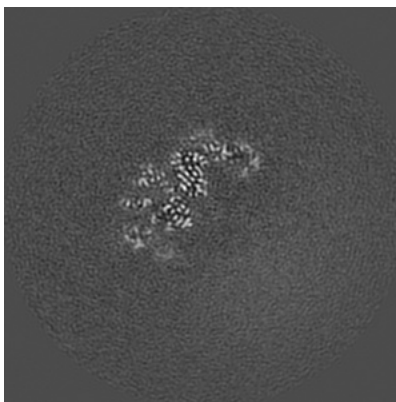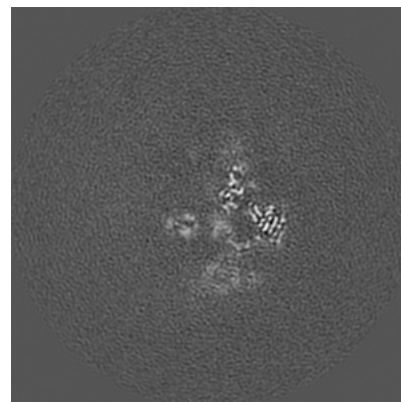
| X Index: 140 | Y Index: 140 | Z Index: 140 |

6.2.2 Raw map
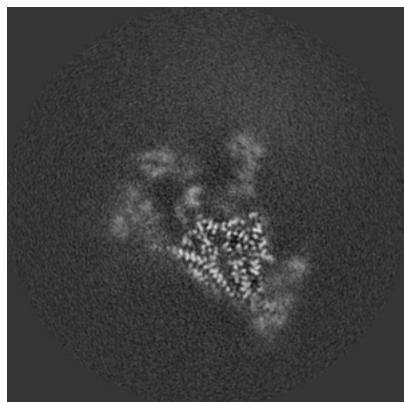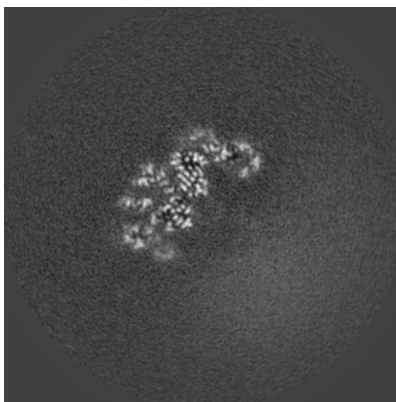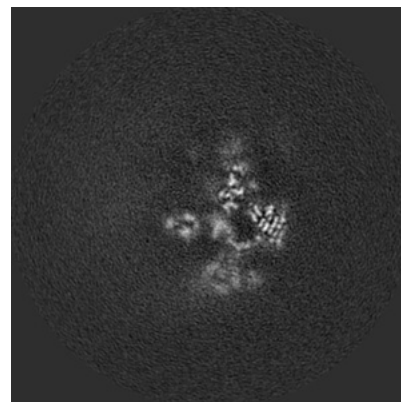
| X Index: 140 | Y Index: 140 | Z Index: 140 |

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

6.3 Largest variance slices (i)

6.3.1 Primary map
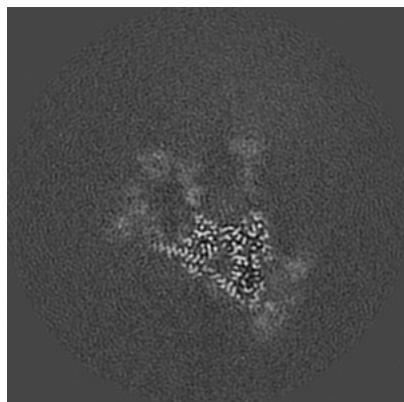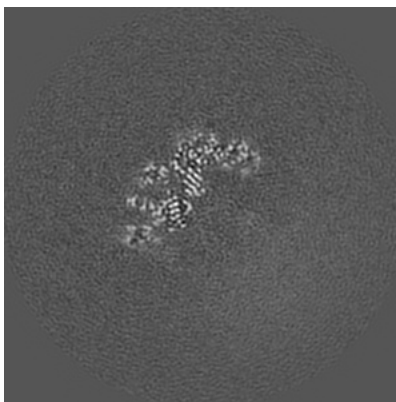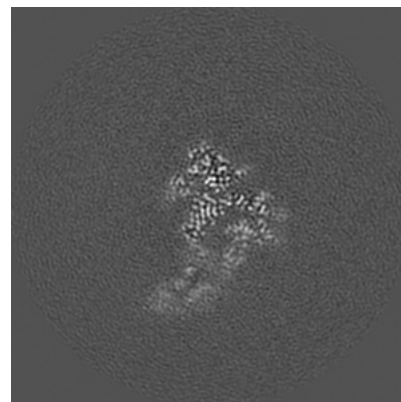
| X Index: 138 | Y Index: 138 | Z Index: 121 |

6.3.2 Raw map
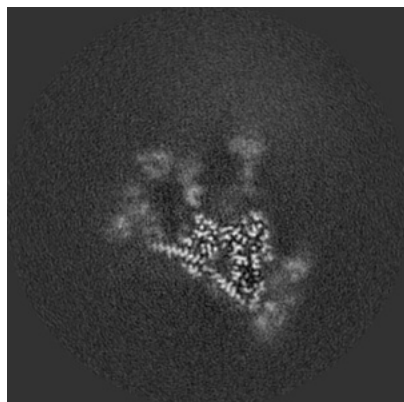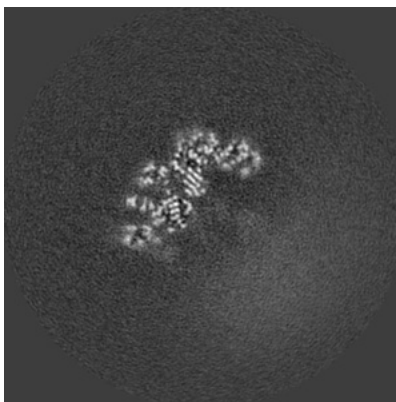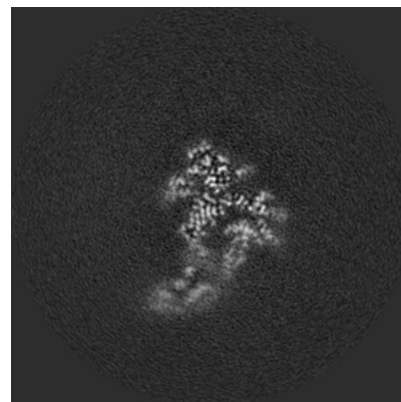
| X Index: 138 | Y Index: 138 | Z Index: 121 |

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
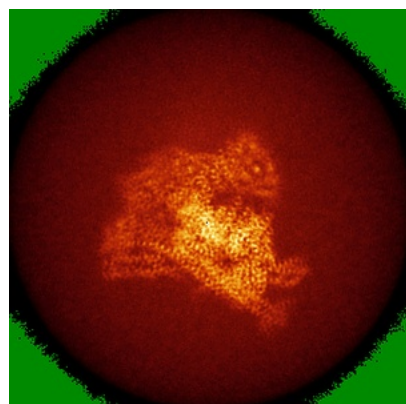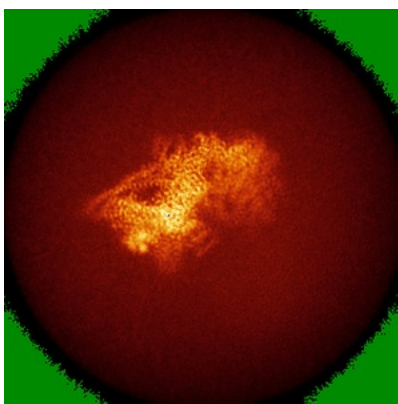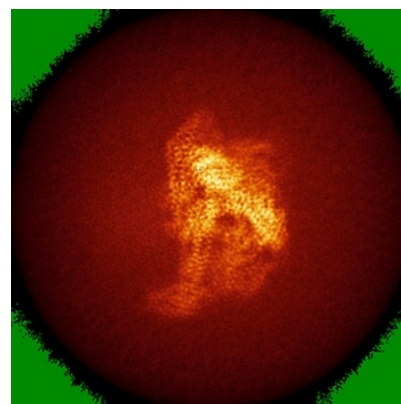
<div align="center">X   Y   Z</div>

6.4.2 Raw map

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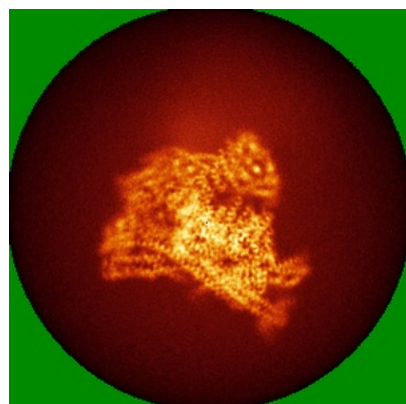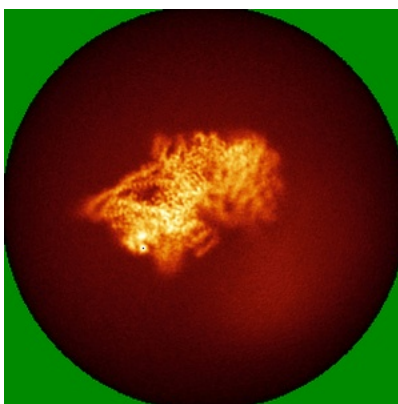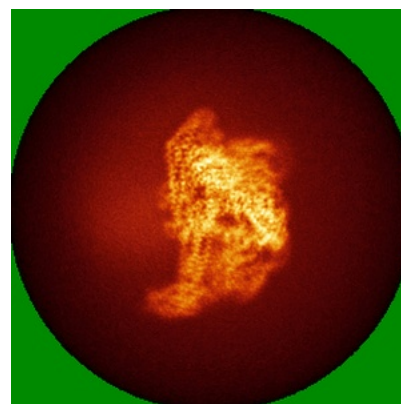
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5   Orthogonal surface views ⓘ

6.5.1   Primary map

| X | Y | Z |
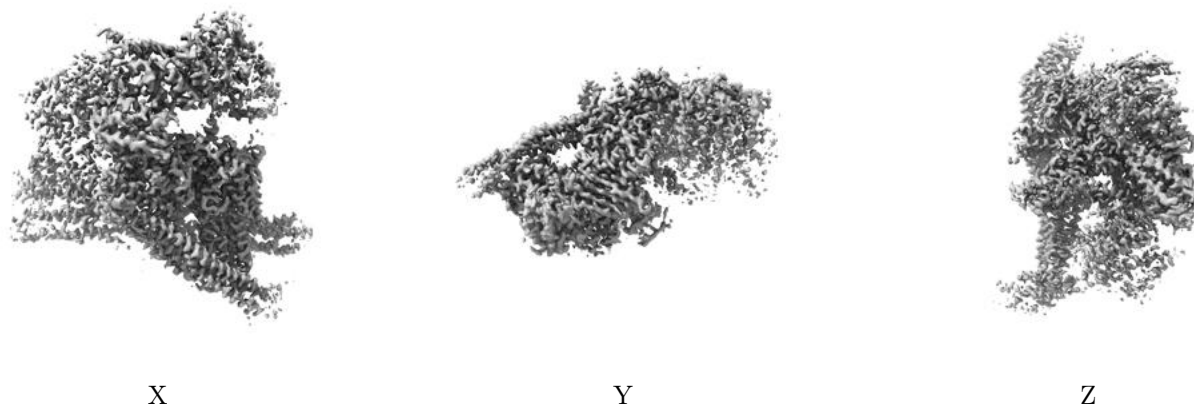
The images above show the 3D surface view of the map at the recommended contour level 0.0354. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2   Raw map

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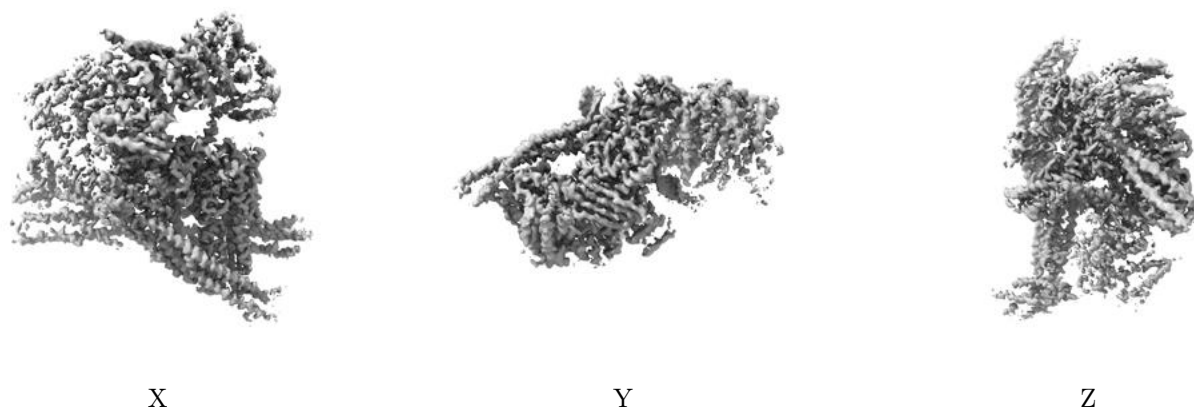
These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

6.6   Mask visualisation ⓘ

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

7 Map analysis ⓘ

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

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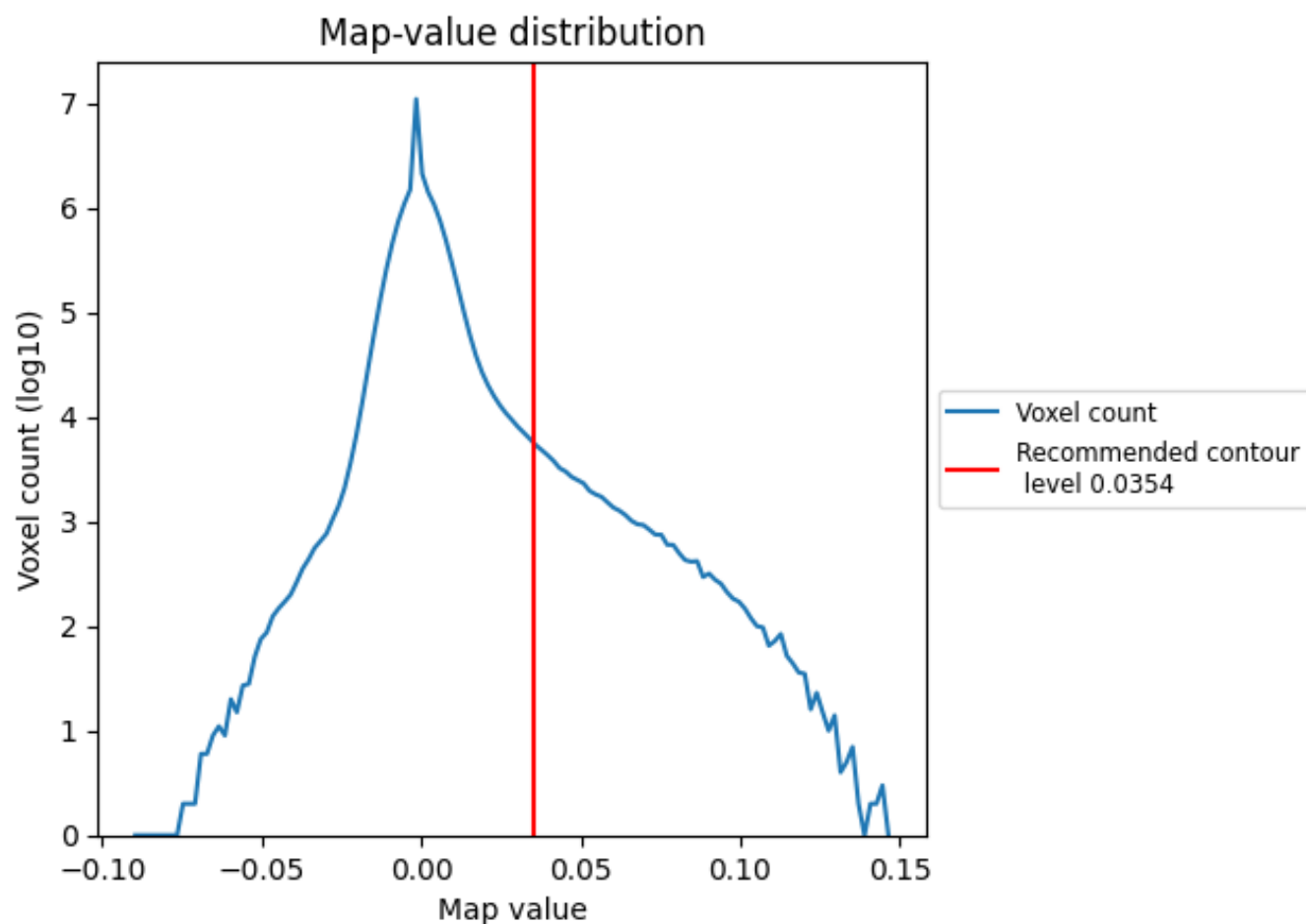
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2　Volume estimate ⓘ
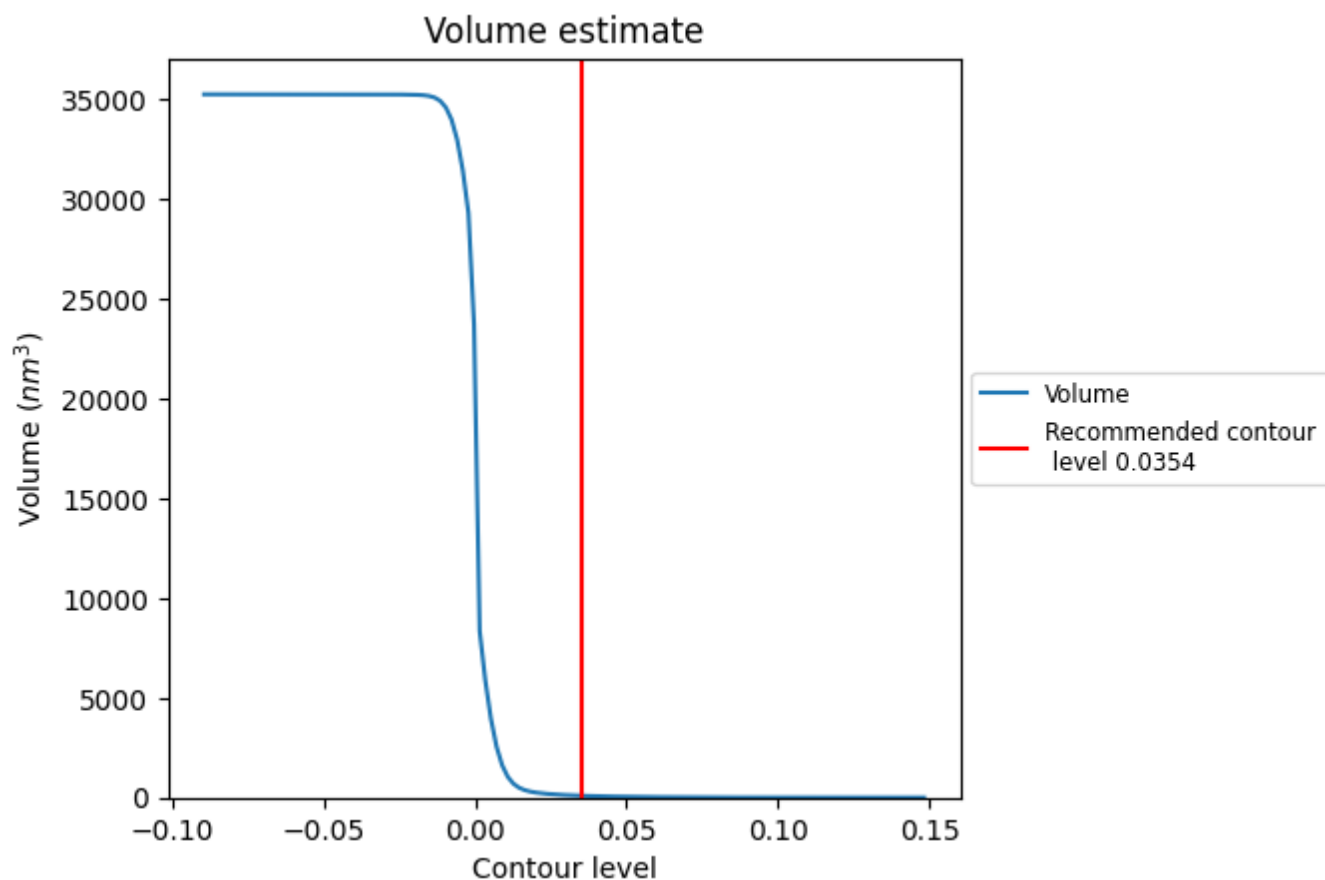
The volume at the recommended contour level is 89 nm^3; this corresponds to an approximate mass of 80 kDa.

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   ⓘ
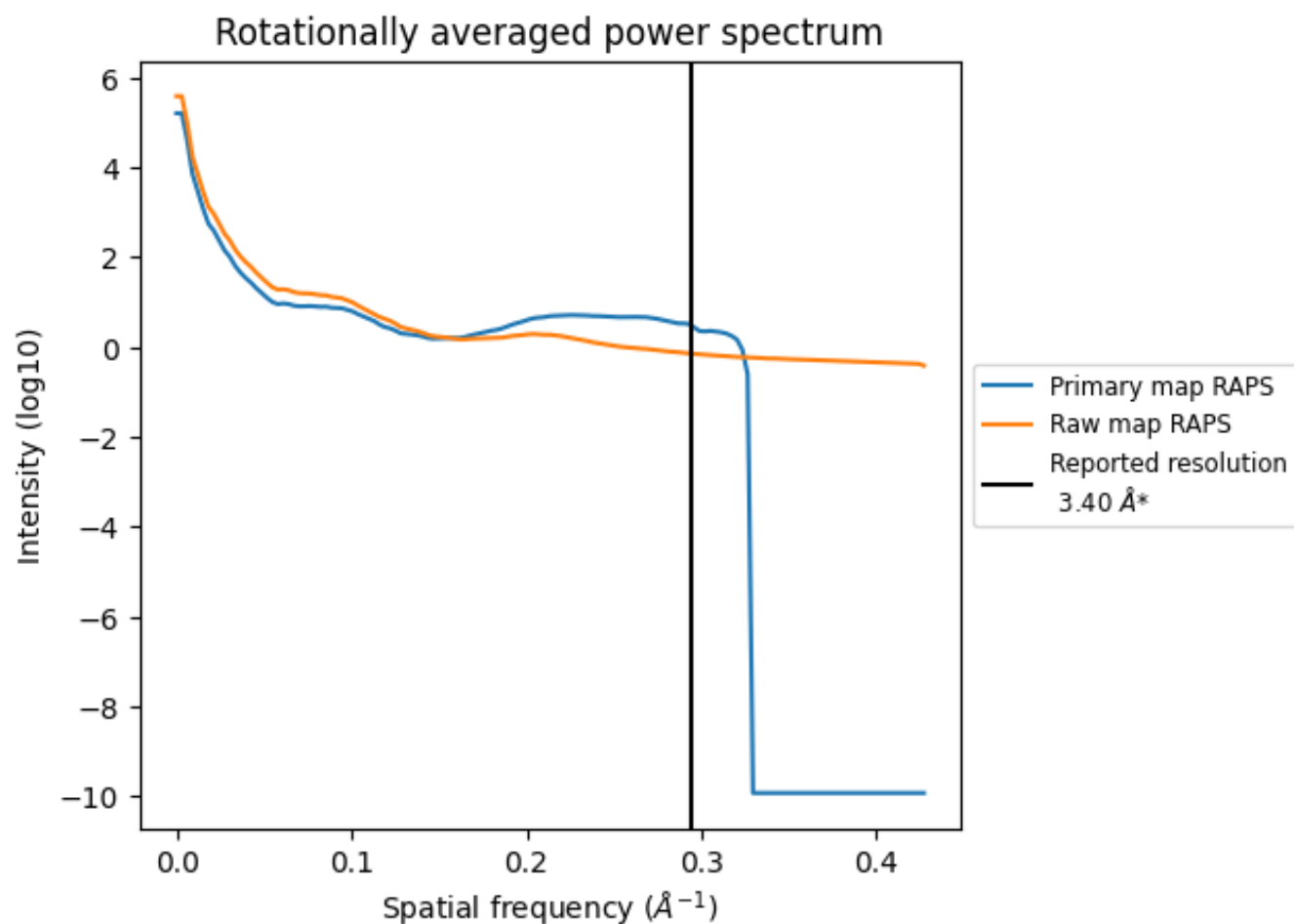
*Reported resolution corresponds to spatial frequency of 0.294 Å^{-1}

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 ⓘ
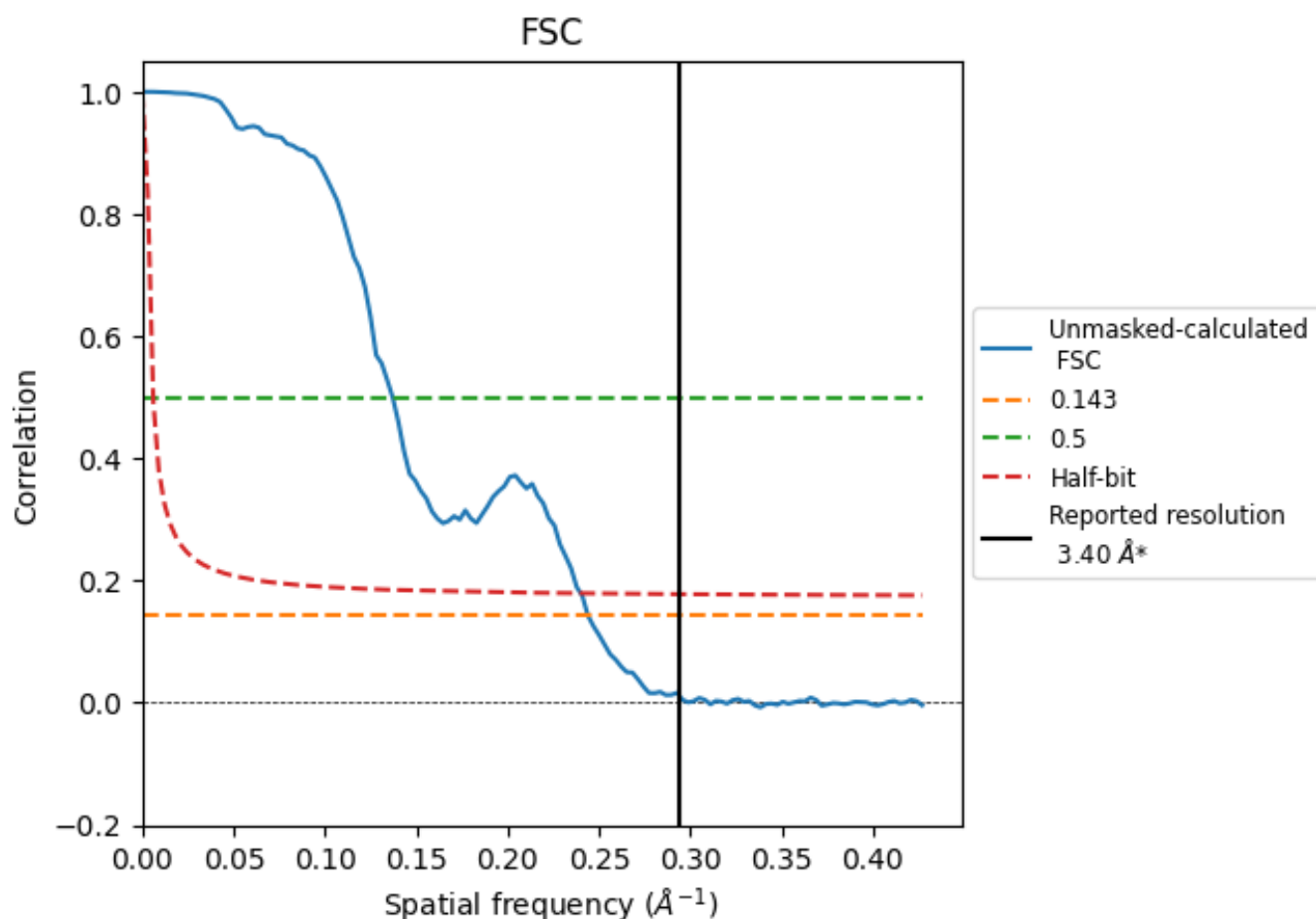
*Reported resolution corresponds to spatial frequency of 0.294 Å^{-1}

8.2 Resolution estimates (i)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.40	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	4.10	7.29	4.16

*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 4.10 differs from the reported value 3.4 by more than 10 %

9 Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-17224 and PDB model 8OVW. Per-residue inclusion information can be found in section 3 on page 7.

9.1 Map-model overlay ⓘ
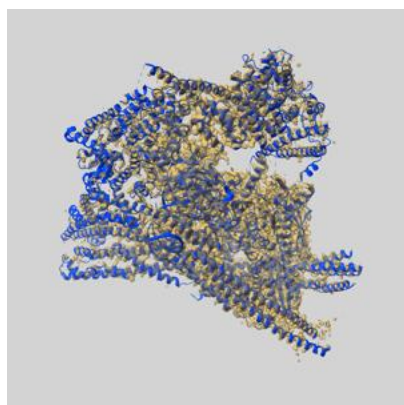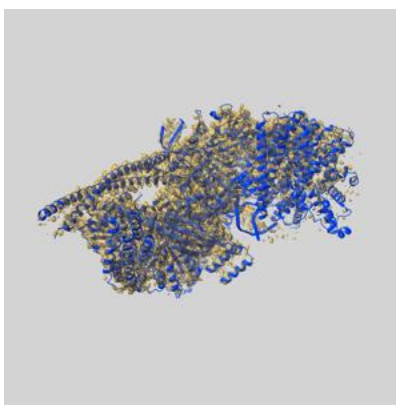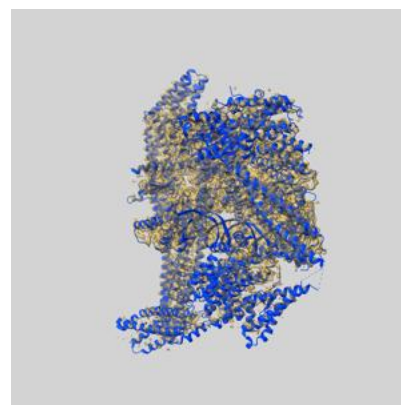
| X | Y | Z |

The images above show the 3D surface view of the map at the recommended contour level 0.0354 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)
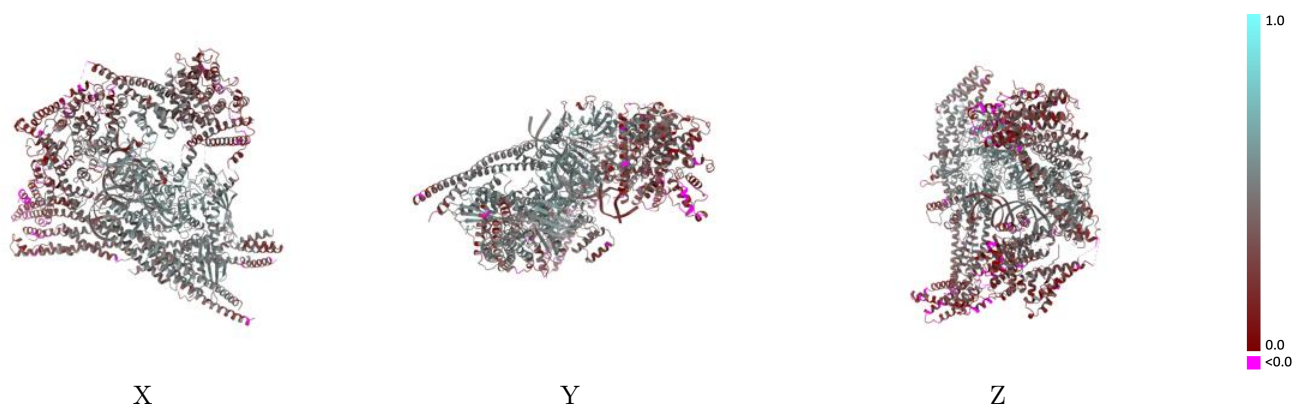
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.
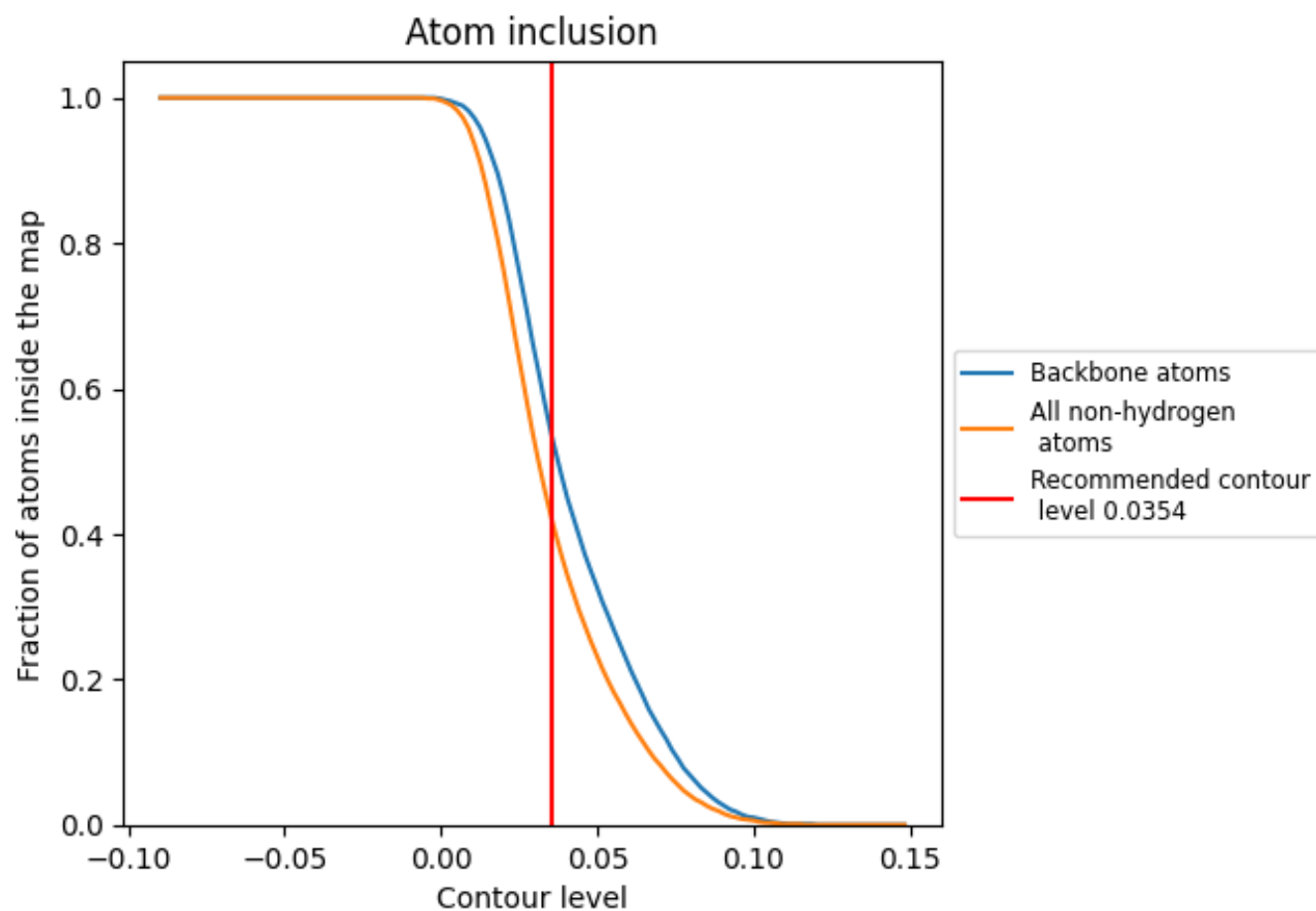
9.3 Atom inclusion mapped to coordinate model (i)
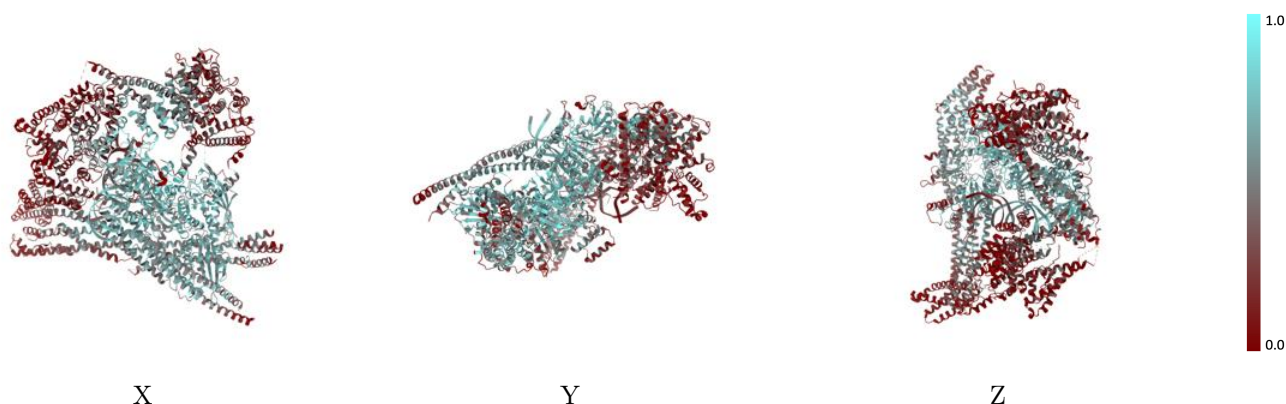
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.0354).

9.4 Atom inclusion ⓘ

At the recommended contour level, 54% of all backbone atoms, 42% 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 (0.0354) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.4210	0.3860
A	0.5090	0.4540
B	0.5130	0.4450
D	0.5480	0.3860
E	0.5450	0.3950
H	0.2280	0.3100
I	0.2900	0.3150
K	0.1750	0.2700
L	0.6430	0.4990
N	0.6130	0.4910
O	0.5440	0.4580
P	0.6340	0.4960
Q	0.3620	0.3260
T	0.1430	0.3370
U	0.4390	0.3690
W	0.1730	0.3330
Y	0.3990	0.3630
Z	0.3340	0.3280

1.0

0.0
<0.0