W O R L D W I D E
wwPDB
P R O T E I N   D A T A   B A N K

wwPDB EM Validation Summary Report (i)

Jul 29, 2024 – 10:57 am BST

PDB ID	:	8PKP
EMDB ID	:	EMD-17751
Title	:	Cryo-EM structure of the apo Anaphase-promoting complex/cyclosome (APC/C) at 3.2 Angstrom resolution
Authors	:	Hoefler, A.; Yu, J.; Chang, L.; Zhang, Z.; Yang, J.; Boland, A.; Barford, D.
Deposited on	:	2023-06-27
Resolution	:	3.20 Å(reported)
Based on initial model	:	5G05

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

EMDB validation analysis	:	0.0.1.dev92
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

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 3.20 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.
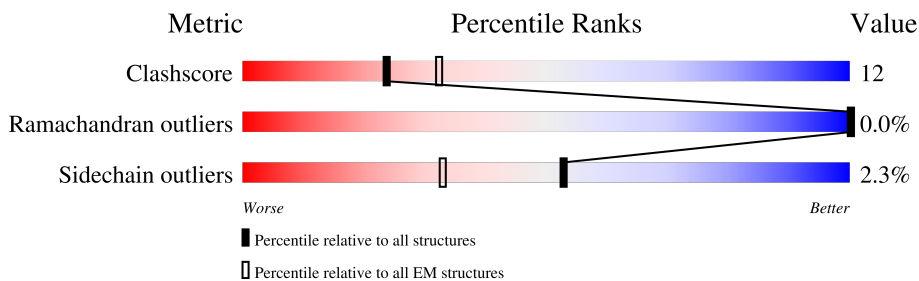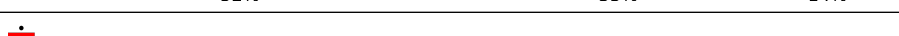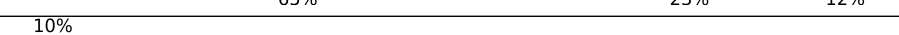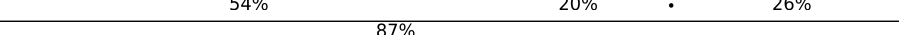
Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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.

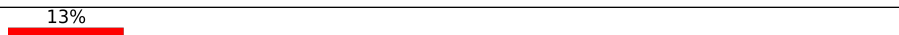| Mol	Chain	Length	Quality of chain
1	A	1944	58% 23% 19%
2	D	121	38% 8% 54%
3	G	85	22% 9% 68%
3	W	85	26% • 71%
4	H	110	41% 11% 48%
5	J	824	40% 17% • 42%
5	P	824	41% 17% • 41%
6	K	620	64% 18% • 17%

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Mol	Chain	Length	Quality of chain
6	Q	620	58% 22% 19%
7	L	185	59% 35%
8	M	74	55% 22% 22%
9	O	755	67% 23% 10%
10	U	597	66% 18% 16%
10	V	597	69% 20% 11%
11	Y	565	11% 52% 36% 12%
11	Z	565	13% 52% 33% 14%
12	I	814	65% 23% 12%
13	N	822	10% 54% 20% 26%
14	C	84	87% 81% 18%

2   Entity composition ⓘ

There are 15 unique types of molecules in this entry. The entry contains 63749 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 Anaphase-promoting complex subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	1580	Total	C	N	O	S	0	0
			12284	7873	2074	2251	86		

- Molecule 2 is a protein called Anaphase-promoting complex subunit 15.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	D	56	Total	C	N	O	S	0	0
			458	291	77	89	1		

- Molecule 3 is a protein called Anaphase-promoting complex subunit CDC26.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	G	27	Total	C	N	O	S	0	0
			226	142	42	41	1		
3	W	25	Total	C	N	O	S	0	0
			217	136	41	39	1		

- Molecule 4 is a protein called Anaphase-promoting complex subunit 16.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	H	57	Total	C	N	O	S	0	0
			459	296	75	86	2		

- Molecule 5 is a protein called Cell division cycle protein 27 homolog.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	J	476	Total	C	N	O	S	1	0
			3601	2300	615	662	24		
5	P	484	Total	C	N	O	S	0	0
			3883	2497	653	707	26		

- Molecule 6 is a protein called Cell division cycle protein 16 homolog.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	K	512	Total 4134	C 2657	N 697	O 755	S 25	0	0
6	Q	504	Total 4049	C 2603	N 681	O 741	S 24	0	0

- Molecule 7 is a protein called Anaphase-promoting complex subunit 10.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	L	179	Total 1446	C 906	N 263	O 270	S 7	0	0

- Molecule 8 is a protein called Anaphase-promoting complex subunit 13.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	M	58	Total 478	C 301	N 78	O 97	S 2	0	0

- Molecule 9 is a protein called Anaphase-promoting complex subunit 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	O	683	Total 5404	C 3444	N 941	O 993	S 26	0	0

- Molecule 10 is a protein called Cell division cycle protein 23 homolog.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	U	503	Total 4121	C 2655	N 690	O 751	S 25	0	0
10	V	534	Total 4393	C 2826	N 740	O 802	S 25	0	0

- Molecule 11 is a protein called Anaphase-promoting complex subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	Y	499	Total 3907	C 2471	N 681	O 728	S 27	1	0
11	Z	486	Total 3807	C 2413	N 664	O 705	S 25	1	0

- Molecule 12 is a protein called Anaphase-promoting complex subunit 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	I	718	Total 5705	C 3656	N 945	O 1070	S 34	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	809	GLU	-	expression tag	UNP Q9UJX5
I	810	ASN	-	expression tag	UNP Q9UJX5
I	811	LEU	-	expression tag	UNP Q9UJX5
I	812	TYR	-	expression tag	UNP Q9UJX5
I	813	PHE	-	expression tag	UNP Q9UJX5
I	814	GLN	-	expression tag	UNP Q9UJX5

- Molecule 13 is a protein called Anaphase-promoting complex subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	N	612	Total 4601	C 2913	N 805	O 858	S 25	0	0

- Molecule 14 is a protein called Anaphase-promoting complex subunit 11.

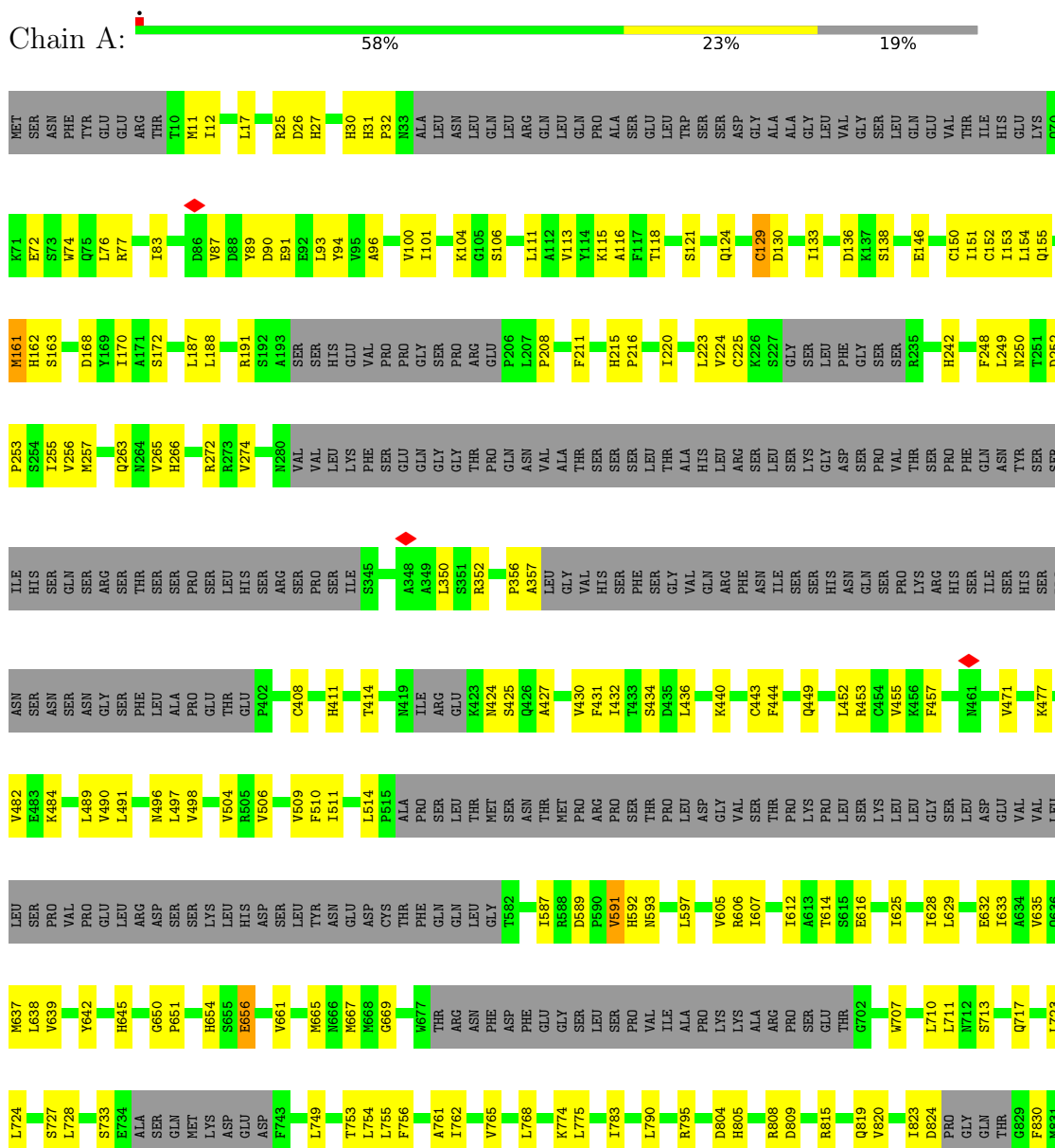| Mol	Chain	Residues	Atoms					AltConf	Trace
14	C	83	Total 572	C 365	N 102	O 93	S 12	0	0

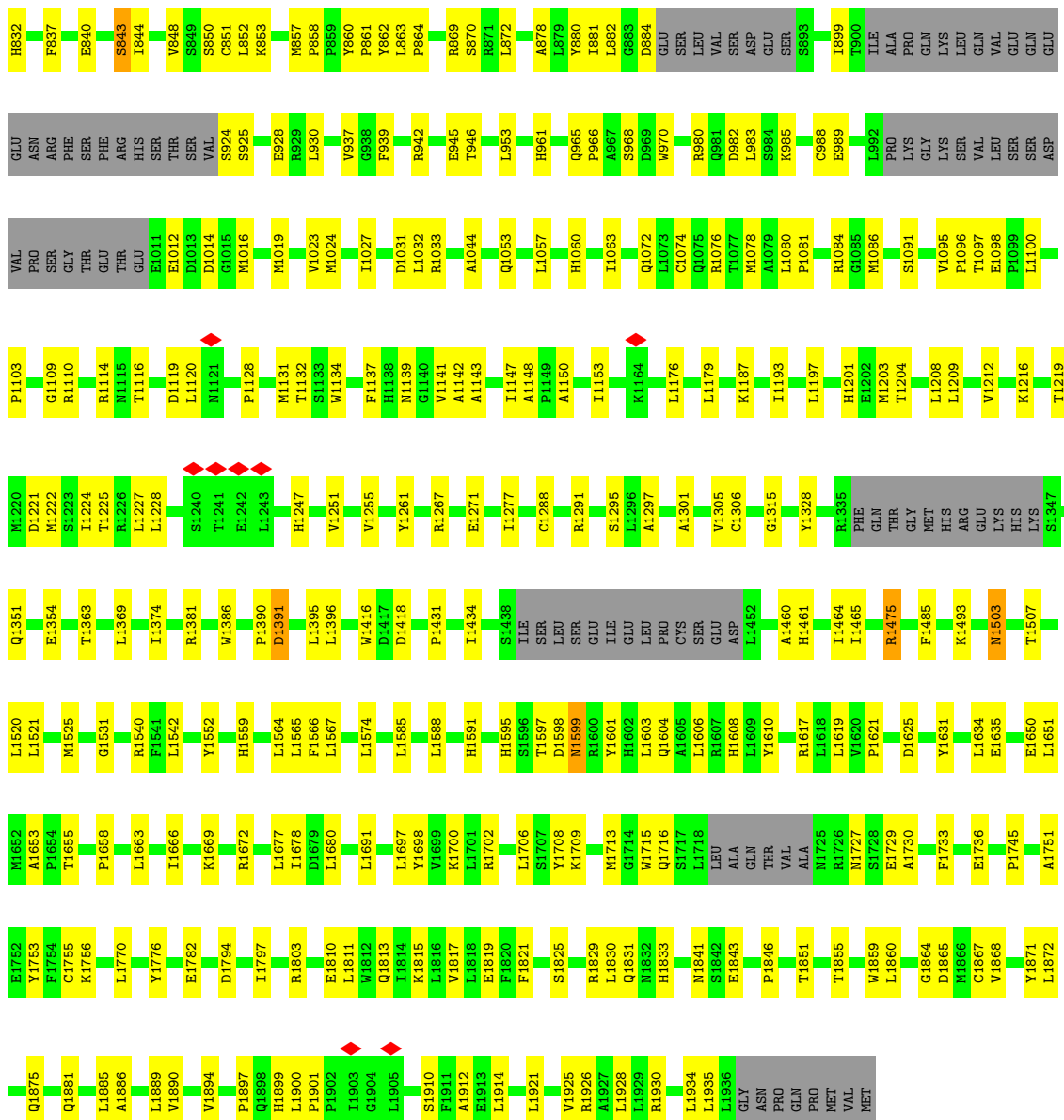- Molecule 15 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

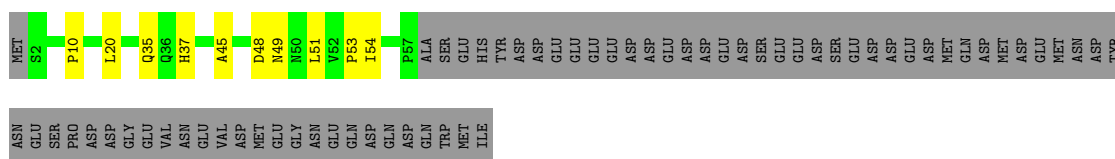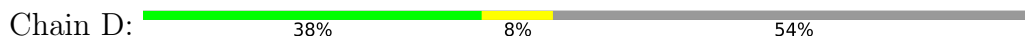| Mol	Chain	Residues	Atoms		AltConf
15	N	1	Total 1	Zn 1	0
15	C	3	Total 3	Zn 3	0

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.

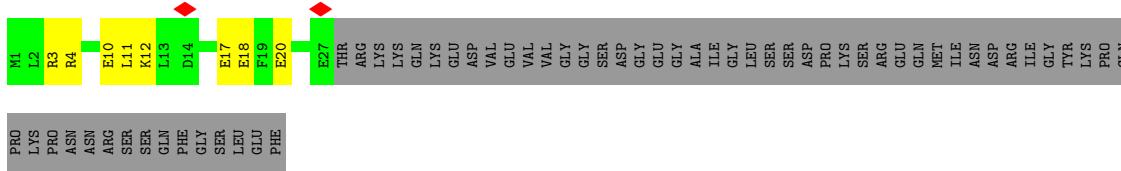• Molecule 1: Anaphase-promoting complex subunit 1

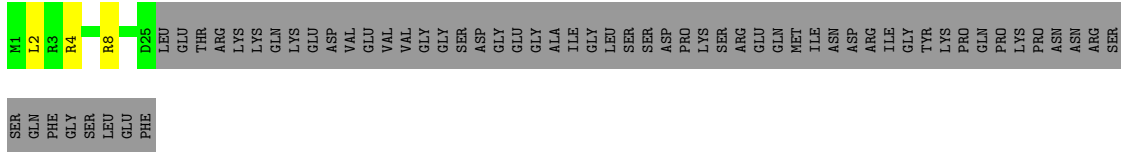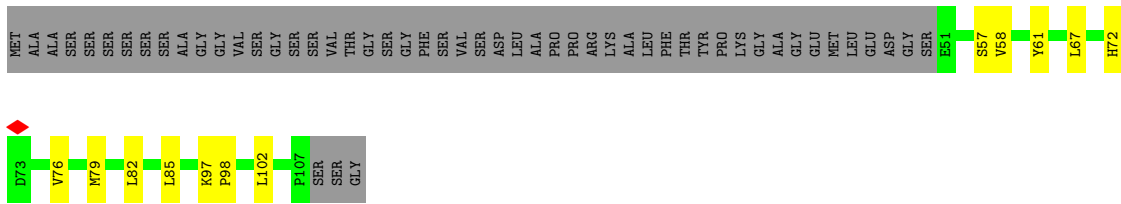• Molecule 2: Anaphase-promoting complex subunit 15

Chain D:

• Molecule 3: Anaphase-promoting complex subunit CDC26

Chain G:

M1 L2 R3 R4 E10 L11 K12 L13 D14 E17 E18 F19 E20 E27 THR ARG LYS LYS GLN LYS GLU ASP VAL GLU VAL GLY GLY SER ASP GLY GLU GLY ALA ILE GLY LEU SER SER ASP PRO LYS SER ARG GLU GLN MET ILE ASN ASP ARG ILE GLY TYR LYS PRO GLN

PRO LYS PRO ASN ARG SER SER GLN PHE GLY SER LEU GLU PHE

• Molecule 3: Anaphase-promoting complex subunit CDC26

Chain W: 26% · 71%

M1 L2 R3 R4 R8 D25 LEU GLU THR ARG LYS LYS GLN LYS GLU ASP VAL GLU VAL VAL GLY GLY SER ASP GLY GLU GLY ALA ILE GLY LEU SER SER ASP PRO LYS SER ARG GLU GLN MET ILE ASN ASP ARG ILE GLY TYR LYS PRO GLN PRO LYS PRO ASN ARG SER

SER GLN PHE GLY SER LEU GLU PHE

• Molecule 4: Anaphase-promoting complex subunit 16

Chain H: 41% 11% 48%

MET ALA ALA SER SER SER SER ALA GLY GLY VAL SER GLY SER SER VAL THR GLY SER GLY PHE SER VAL SER ASP LEU ALA PRO PRO ARG LYS ALA LEU PHE THR TYR PRO LYS GLY ALA GLY GLU MET LEU GLU ASP GLY SER E51 S57 V58 Y61 L67 H72

D73 V76 M79 L82 L85 K97 P98 L102 P107 SER SER GLY

• Molecule 5: Cell division cycle protein 27 homolog

Chain J: 40% 17% · 42%

MET THR VAL LEU Q5 E6 P7 V8 Y21 L27 R30 L31 Y32 E38 F42 R50 S51 G52 K53 K56 H64 S65 C66 T67 T68 P69 Q70 C71 C79 V80 E87 L92 G95 V96 F97 Q100 H103 D104 D105 I106 V107 F110 S113

T117 L120 V124 Y125 T128 D129 R130 S135 Y138 Q139 K140 S141 L142 S143 L144 W149 S150 P151 F152 E153 S154 I158 G159 E160 K161 P162 D163 P164 F170 THR SER LEU GLN ASN PHE SER ASN CYS LEU PRO ASN SER CYS THR THR GLN VAL PRO ASN HIS SER LEU

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

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

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

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

SER SER ILE ILE LEU GLU GLY LYS ILE SER THR ILE THR PRO GLN ILE GLN GLN A451 A459 L462 M463 S464 L465 L466 R467 E468 M469 G470 K471 L474 A475 L476 N480 C481 K482 E483 A484 I485 N486 I487 H490 Y496 N497 T498 G499 W500 V501 L502 C503 A508 Y509 L512
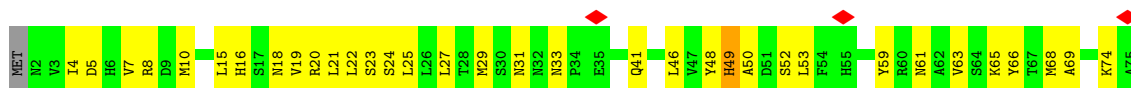
• Molecule 5: Cell division cycle protein 27 homolog

Chain P: 41%   17%   •   41%

• Molecule 6: Cell division cycle protein 16 homolog

Chain K: 64%   18%   •   17%

M1 N2 L3 L6 R7 V10 Y13 Y19 R34 E35 E36 P37 I40 Y48 L49 T50 L60 R61 S62 R63 K64 L65 D66 K67 C72 C79 H80 Y81 E85 Q88 A89 L90 D94 MET GLU GLU PRO ILE ASN LYS ARG LEU PHE GLU LYS TYR LEU

LYS ASP GLU GLY PHE LYS ASP PRO SER SER ASP TRP GLU MET SER GLN SER S127 C133 L134 L135 I139 Y140 R146 T150 Y151 S152 Y153 K154 E155 K158 L159 D160 E165 A166 F167 L170 T171 H174 E181 L190 S191 K192 L193 C194 E197 Q198

L201 L204 L209 K210 K211 Y212 N213 E217 E222 L227 D232 D246 K252 V256 F263 H264 A265 S266 G273 T274 L275 V276 E277 L284 L291 P299 V300 S301 V305 Y308 E317 H318 Y333 I338 H342 V346 H350 D351

M354 A355 A356 Y357 F358 T359 H368 L369 P370 M371 L372 Y373 I374 E377 L386 R389 I397 D401 P402 F403 V404 M405 H406 F425 K431 G436 E445 P446 L447 L451 L465 V473 L474 A484 I485 I488 M492 D500 H503 T504

L519 I523 G528 ASP SER GLU ALA TYR ILE GLY ALA ASP ILE ASP LYS LEU LYS C544 M552 K553 I558 I559 SER PRO PRO ASP PHE GLU ARG GLU PHE GLU VAL GLU LYS GLN THR ALA GLU GLU THR GLY LEU THR PRO LEU GLU THR SER ARG LYS THR ASP SER

ARG PRO SER LEU GLU GLU THR PHE GLU ILE GLU MET ASN GLN SER ASP MET MET LEU GLU THR SER MET SER ASP HIS SER THR

• Molecule 6: Cell division cycle protein 16 homolog

Chain Q:

58%   22%   •   19%

MET N2 L6 V10 Y13 Q16 Q17 Q18 Y19 Q20 L23 F24 W25 A26 D27 K28 V29 L32 E35 I40 L43 L47 Y48 L49 R55 A56 A57 L60 R61 S62 R63 L75 H80 K84 Q88 A89 L93 D94 M95 GLU GLU PRO ILE

ASN LYS ARG LEU PHE GLU LYS TYR LEU LYS ASP GLU SER GLY PHE LYS ASP PRO SER SER ASP TRP GLU MET S124 K129 C133 L134 L135 R136 R146 T150 E155 A156 L157 K158 L159 D160 V161 Y162 E165 L169 L170 M175 L176 T177 A178 Q179 E180 E183 L184

L185 L188 P189 L190 C194 N195 E196 E197 L201 N207 K211 Y212 N213 K214 L231 D232 V233 V234 C250 L253 T254 V257 M258 F263 V276 L284 F285 S288 H289 K290 L294 N298 P299 W302 Y308 Y309 L310 M311 R320 R321 Y322 L323

S324 K325 T328 L329 E330 Y333 Y340 G341 H342 S343 V346 Y357 K365 H368 M371 L372 Y373 I374 N382 L395 D401 M405 H406 E407 V410 F413 K423 L426 L429 E430 I432 K433 V439 T440 V441 W444 L448 L451

V454 C455 R456 K457 L458 K459 K460 Y461 Y467 L472 P476 Q477 N478 T481 L485 I488 H489 M492 N497 R509 R510 D511 D512 T513 T517 Y533 ILE GLY ALA ASP ILE LYS ASP LYS LEU LYS CYS TYR ASP PHE ASP SER MET VAL HIS THR MET LEU GLU THR SER MET

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

SER ASP HIS SER THR

• Molecule 7: Anaphase-promoting complex subunit 10
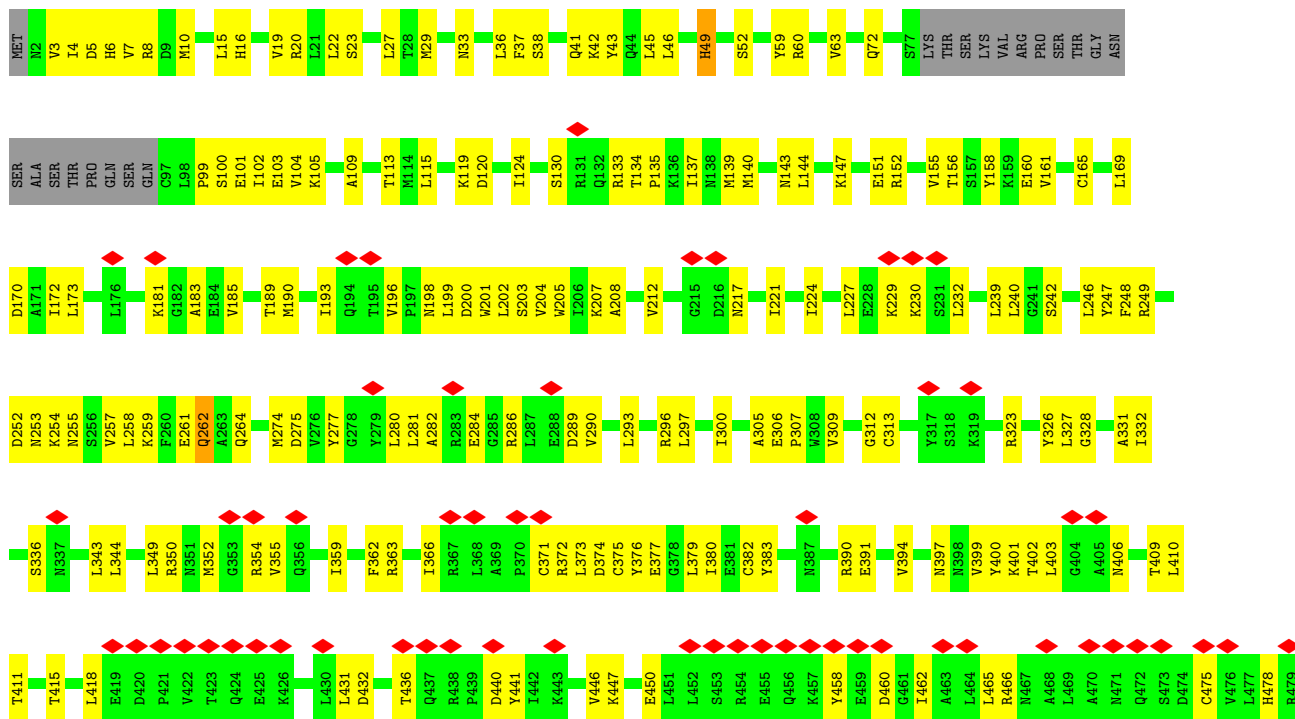
Chain L:

59%   35%   • •

• Molecule 8: Anaphase-promoting complex subunit 13

Chain M:

• Molecule 9: Anaphase-promoting complex subunit 5
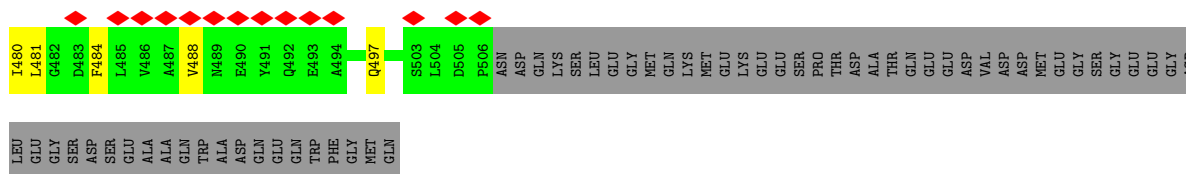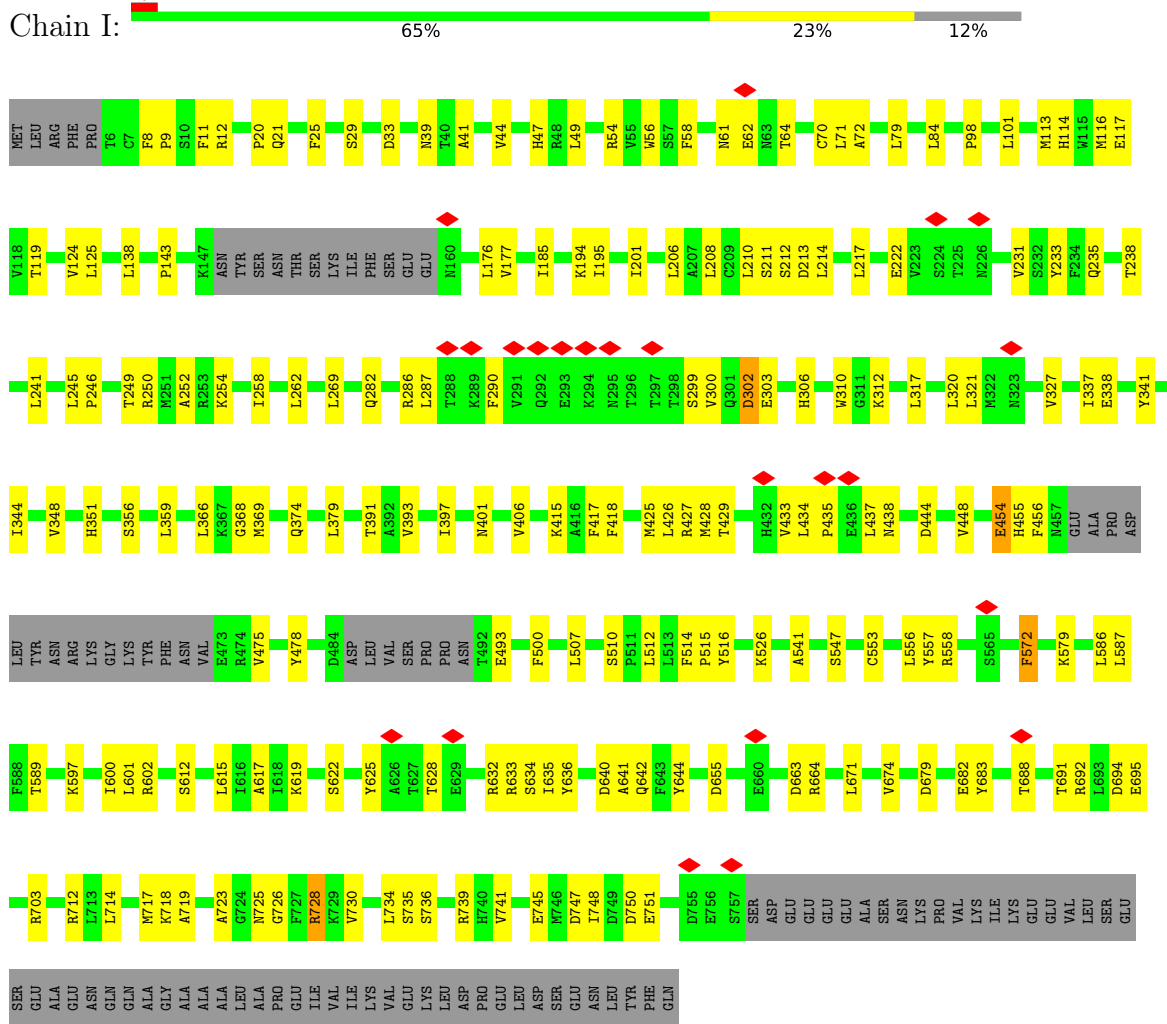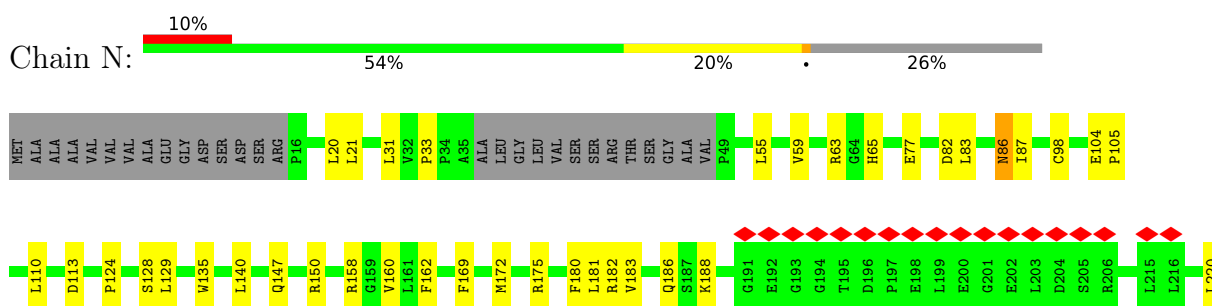
Chain O:

• Molecule 10: Cell division cycle protein 23 homolog

Chain U:

- Molecule 10: Cell division cycle protein 23 homolog

Chain V:

69% 20% 11%

- Molecule 11: Anaphase-promoting complex subunit 7

Chain Y:

11%

52% 36% 12%

L76 SER LYS SER LYS VAL ARG PRO SER THR GLY ASN SER ALA SER THR PRO GLN SER GLN CYS L98 E101 K105 M108 A109 Y112 T113 M114 L115 K116 Q117 D118 I122 D126 S130 R131 Q132 R133 K136 I137 N138 M139 M140 L144 Y145 K146 K147 A148 G149

Q150 E151 R152 V155 T156 S157 Y158 K159 E160 V161 L162 R163 D170 G174 L175 L176 S177 L178 S179 V185 A186 S187 M188 T189 M190 I193 Q194 S203 I206 K207 A208 Y209 A210 F211 V212 H213 T214 G215 D216 N217 S218 R219 A220 I221 S222 T223 I224 K229 L232 L233 R234

D235 L239 L240 D245 G251 D252 N253 K254 V257 F260 E261 Q262 A263 L266 D267 P268 I271 M274 D275 V276 Y277 L280 L281 E284 D289 V290 L293 R296 L297 F298 N299 I300 S301 D302 Q303 H304 A305 E306 P307 W308 V309 K319 R320 Y321 L325

Y326 L327 G328 A329 K330 A331 I332 Q333 L334 N335 S336 N337 S338 V339 Q340 A341 L342 L343 L344 K345 L349 R350 N351 M352 G353 R354 V355 Q356 E357 A358 I359 I360 H361 F362 R363 R367 R372 L373 E377 G378 L379 I380 E381 A385 S386 N387 S388 I389 R390 M393 V394 M395 A396 N397

N398 K401 T402 L403 G404 A405 N406 A407 Q408 T409 L410 T411 L412 L413 A414 T415 V416 C417 L418 E419 D420 P421 V422 T423 Q424 E425 K426 A427 K428 T429 L430 L431 D432 K433 A434 L435 T436 D440 Y441 I442 K443 A444 V445 V446 K447 K448 A449 E450 L451 R454 E459 D460 G461 I462 A463 L464

L465 R466 N467 A468 L469 S473 V476 L477 H478 R479 I480 L481 G482 D483 F484 L485 V486 A487 V488 N489 E490 Y491 Q492 Q497 Y498 S499 L502 S503 N507 D508 Q509 K510 S511 L512 M515 Q516 K517 M518 E519 K520 E521 GLU SER PRO THR ASP THR GLN GLU GLU ASP VAL ASP

ASP MET GLU GLY SER GLU GLU GLY ASP LEU GLU GLY SER ASP SER GLU ALA ALA GLN TRP ALA ASP GLN GLU GLN TRP PHE GLY MET GLN

• Molecule 11: Anaphase-promoting complex subunit 7

Chain Z:
13%
52% 33% 14%

MET N2 V3 I4 D5 H6 V7 R8 D9 M10 L15 H16 V19 R20 L21 L22 S23 L27 T28 M29 N33 L36 F37 S38 Q41 K42 Y43 Q44 L45 L46 H49 S52 Y59 R60 V63 Q72 S77 LYS THR SER LYS VAL ARG PRO SER THR GLY ASN

SER ALA SER THR PRO GLN SER GLN C97 L98 P99 S100 E101 I102 E103 V104 K105 A109 T113 M114 L115 K119 D120 I124 S130 R131 Q132 R133 T134 P135 K136 I137 N138 M139 M140 N143 L144 K147 E151 R152 V155 T156 S157 Y158 K159 E160 V161 C165 L169

D170 A171 I172 L173 L176 K181 G182 A183 E184 V185 T189 M190 I193 Q194 T195 V196 P197 N198 L199 D200 W201 L202 S203 V204 W205 I206 K207 A208 V212 G215 D216 N217 I221 I224 L227 E228 K229 K230 S231 L232 L239 L240 G241 S242 L246 Y247 F248 R249

D252 N253 K254 N255 S256 V257 L258 K259 F260 E261 Q262 A263 Q264 M274 D275 V276 Y277 G278 Y279 L280 L281 A282 R283 E284 G285 R286 L287 E288 D289 V290 L293 R296 L297 I300 A305 E306 P307 W308 V309 G312 C313 Y317 S318 K319 R323 Y326 L327 G328 A331 I332

S336 N337 L343 L344 L349 R350 N351 M352 G353 R354 V355 Q356 I359 F362 R363 I366 R367 L368 A369 P370 C371 R372 L373 D374 C375 Y376 E377 G378 L379 I380 E381 C382 Y383 N387 R390 E391 V394 N397 N398 V399 Y400 K401 T402 L403 G404 A405 N406 T409 L410

T411 T415 L418 E419 D420 P421 V422 T423 Q424 E425 K426 L430 L431 D432 T436 Q437 R438 P439 D440 Y441 I442 K443 V446 K447 E450 L451 L452 S453 R454 E455 Q456 K457 Y458 E459 D460 G461 I462 A463 L464 L465 R466 N467 A468 L469 A470 Q472 N471 S473 D474 C475 V476 L477 H478 R479

I480 L481 G482 D483 F484 L485 V486 A487 V488 N489 E490 Y491 Q492 E493 A494 Q497 S503 L504 D505 P506 ASN ASP GLN LYS SER LEU GLU MET GLN LYS MET GLU LYS GLU GLU SER PRO THR ASP ALA THR GLN GLU GLU ASP VAL ASP MET GLU GLY SER GLU GLU GLY ASP

LEU GLU GLY SER ASP SER GLU ALA ALA GLN TRP ALA ASP GLN GLU GLN TRP PHE GLY MET GLN

• Molecule 12: Anaphase-promoting complex subunit 4

Chain I:

65% 23% 12%

MET LEU ARG PHE PRO T6 C7 F8 P9 S10 F11 R12 P20 Q21 F25 S29 D33 N39 T40 A41 V44 H47 R48 L49 R54 V55 W56 S57 F58 N61 E62 N63 T64 C70 L71 A72 L79 L84 P98 L101 M113 H114 W115 M116 E117

V118 T119 V124 L125 L138 P143 K147 ASN TYR SER ASN THR SER LYS ILE PHE SER GLU GLU N160 L176 V177 I185 K194 I195 I201 L206 A207 L208 C209 L210 S211 S212 D213 L214 L217 E222 V223 S224 T225 N226 V231 S232 Y233 F234 Q235 T238

L241 L245 P246 T249 R250 M251 A252 R253 K254 I258 L262 L269 Q282 R286 L287 T288 K289 F290 V291 Q292 E293 K294 N295 T296 T297 T298 S299 V300 Q301 D302 E303 H306 W310 G311 K312 L317 L320 L321 M322 N323 V327 I337 E338 Y341

I344 V348 H351 S356 L359 L366 K367 G368 M369 Q374 L379 T391 A392 V393 I397 N401 V406 K415 A416 F417 F418 M425 L426 R427 N428 T429 H432 V433 L434 P435 E436 L437 N438 D444 V448 E454 H455 F456 N457 GLU ALA PRO ASP

LEU TYR ASN ARG LYS GLY LYS TYR PHE ASN VAL E473 R474 V475 Y478 D484 ASP LEU VAL SER PRO PRO ASN T492 E493 F500 L507 S510 P511 L512 L513 F514 P515 Y516 K526 A541 S547 C553 L556 Y557 R558 S565 F572 K579 L586 L587

F588 T589 K597 I600 L601 R602 S612 L615 I616 A617 I618 K619 S622 Y625 A626 T627 T628 E629 R632 R633 S634 I635 Y636 D640 A641 Q642 F643 Y644 D655 E660 D663 R664 L671 V674 D679 E682 Y683 T688 T691 R692 L693 D694 E695

R703 R712 L713 L714 M717 K718 A719 A723 G724 N725 G726 F727 R728 K729 V730 L734 S735 S736 R739 H740 V741 E745 M746 D747 I748 D749 D750 E751 D755 E756 S757 SER ASP GLU GLU GLU GLU ALA SER ASN LYS PRO VAL LYS ILE LYS GLU GLU VAL LEU SER GLU

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

• Molecule 13: Anaphase-promoting complex subunit 2

10%

Chain N:

54% 20% • 26%

MET ALA ALA VAL VAL VAL ALA GLU GLY ASP SER SER ASP SER ARG P16 L20 L21 L31 V32 P33 P34 A35 ALA LEU GLY LEU VAL SER SER ARG THR SER GLY ALA VAL P49 L55 V59 R63 G64 H65 E77 D82 L83 N86 I87 C98 E104 P105

L110 D113 P124 S128 L129 W135 L140 Q147 R150 R158 G159 V160 L161 F162 F169 M172 R175 F180 L181 R182 V183 Q186 S187 K188 G191 E192 G193 G194 T195 D196 P197 E198 L199 E200 G201 E202 L203 D204 S205 R206 L215 L216 L220

C221 A222 G223 C224 S225 S226 D227 K228 Q229 W232 C233 R234 Q235 E238 Q239 F240 H241 Q245 S251 L252 R255 V256 T262 H266 Q267 V268 E271 R272 M273 L286 R287 E288 F289 H290 K291 W292 I293 E294 R295 V296 V297 L300 G301 K302 V303 D307 GLY PRO ALA

ARG PRO ALA SER PRO GLU ALA G318 R325 V328 F332 I335 R340 D350 F351 L361 L365 T368 D369 Q372 Q373 L374 L375 L382 L386 V391 N392 T393 I396 L399 Y400 I401 I404 K405 A406 L407 R408 V409 P412 I416 L417

E418 C421 R425 R429 V435 V439 A440 T443 G444 ASP SER ASP GLY THR GLY ASP LEU ALA VAL GLU LEU SER LYS THR ASP PRO ALA SER LEU GLU THR GLY GLN ASP SER GLU ASP SER G475 E476 D479 P482 D483 D486 ALA ASP PRO GLY LYS SER

SER SER LYS ARG ARG SER S499 D500 I501 L504 L505 V506 S507 I508 Y509 G510 S511 K512 D513 L514 F515 I516 Y519 L523 A524 D525 R526 L527 L528 H529 Q530 F531 S532 F533 S534 P535 E536 R537 E538 I539 R540 N541 V542 E543 L544 L545 K546 L547 R548 F549 G550 E551 A552 P553 M554 H555 F556

L561 K562 I570 N571 A572 N573 I574 R575 E576 E577 D578 GLU LYS ARG PRO ALA GLU GLU GLN PRO PRO F589 G590 V591 V592 A593 V594 I595 L596 S597 S598 W601 P602 PRO PHE LYS ASP GLU LYS LEU GLU GLU VAL P612 E613 D614 I615 Y622 C623 Y626 E627 Q628 L629 K630 A631 M632

R633 T634 L635 S636 W637 M646 E649 L650 A651 D652 R653 T654 L655 S656 V657 I666 Q671 D672 Q673 A674 S675 S682 K683 A684 M687 P688 V689 R693 Q701 Q702 G703 V704 L705 R706 GLU GLU PRO PRO GLY I712 V715 I716 GLU GLU GLU ARG PRO GLN ASP ARG ASP

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

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

• Molecule 14: Anaphase-promoting complex subunit 11

Chain C:

87%

81%　　　　　18%　　•

M1 K2 V3 K4 W8 N9 A12 T13 W14 L15 W16 V17 A18 N19 D20 E21 N22 C23 G24 I25 C26 R27 M28 A29 F30 N31 G32 C33 C34 P35 D36 C37 K38 V39 P40 G41 D42 D43 C44 P45 L46 V47 W48 G49 Q50 C51 S52 H53 C54 F55 H56 M57 H58 C59 I60 L61 K62 W63

L64 H65 A66 Q67 Q68 V69 Q70 Q71 H72 C73 P74 M75 C76 R77 Q78 E79 W80 K81 F82 K83 GLU

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	174356	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 $(e^-/\text{Å}^2)$	40	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	3500	Depositor
Magnification	Not provided	
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	1.975	Depositor
Minimum map value	-0.749	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.083	Depositor
Recommended contour level	0.4	Depositor
Map size (Å)	385.2, 385.2, 385.2	wwPDB
Map dimensions	360, 360, 360	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.07, 1.07, 1.07	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: ZN

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	0.29	0/12566	0.50	0/17085
2	D	0.25	0/470	0.45	0/643
3	G	0.24	0/227	0.55	0/302
3	W	0.28	0/218	0.55	0/288
4	H	0.27	0/468	0.45	0/631
5	J	0.28	0/3686	0.49	0/5000
5	P	0.29	0/3975	0.47	0/5371
6	K	0.28	0/4233	0.47	0/5730
6	Q	0.28	0/4148	0.49	0/5620
7	L	0.27	0/1480	0.55	0/2005
8	M	0.26	0/486	0.51	0/658
9	O	0.32	0/5504	0.49	0/7435
10	U	0.28	0/4218	0.48	0/5701
10	V	0.31	0/4493	0.47	0/6065
11	Y	0.27	0/3970	0.53	0/5365
11	Z	0.25	0/3870	0.51	0/5233
12	I	0.29	0/5824	0.50	0/7888
13	N	0.28	0/4683	0.53	0/6369
14	C	0.29	0/592	0.46	0/819
All	All	0.29	0/65111	0.50	0/88208

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts (i)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	12284	0	12181	311	0
2	D	458	0	434	13	0
3	G	226	0	233	9	0
3	W	217	0	231	3	0
4	H	459	0	449	10	0
5	J	3601	0	3314	99	0
5	P	3883	0	3834	117	0
6	K	4134	0	4060	85	0
6	Q	4049	0	3948	108	0
7	L	1446	0	1423	48	0
8	M	478	0	454	15	0
9	O	5404	0	5452	135	0
10	U	4121	0	4046	81	0
10	V	4393	0	4362	92	0
11	Y	3907	0	3975	158	0
11	Z	3807	0	3885	141	0
12	I	5705	0	5655	130	0
13	N	4601	0	4327	117	0
14	C	572	0	452	9	0
15	C	3	0	0	0	0
15	N	1	0	0	0	0
All	All	63749	0	62715	1524	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.

The worst 5 of 1524 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)
5:P:12:ILE:HG21	5:P:43:LEU:HD21	1.56	0.86
12:I:719:ALA:HA	12:I:735:SER:HA	1.58	0.83
1:A:83:ILE:HD11	9:O:541:ILE:HD13	1.61	0.83
6:Q:161:VAL:HG23	6:Q:188:LEU:HD12	1.62	0.81
11:Y:112:TYR:HB3	11:Y:117:GLN:HB2	1.60	0.81

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	1546/1944 (80%)	1493 (97%)	52 (3%)	1 (0%)	51	83
2	D	54/121 (45%)	54 (100%)	0	0	100	100
3	G	25/85 (29%)	25 (100%)	0	0	100	100
3	W	23/85 (27%)	23 (100%)	0	0	100	100
4	H	55/110 (50%)	55 (100%)	0	0	100	100
5	J	471/824 (57%)	456 (97%)	15 (3%)	0	100	100
5	P	480/824 (58%)	467 (97%)	13 (3%)	0	100	100
6	K	506/620 (82%)	489 (97%)	17 (3%)	0	100	100
6	Q	500/620 (81%)	490 (98%)	10 (2%)	0	100	100
7	L	175/185 (95%)	167 (95%)	8 (5%)	0	100	100
8	M	54/74 (73%)	51 (94%)	3 (6%)	0	100	100
9	O	675/755 (89%)	664 (98%)	11 (2%)	0	100	100
10	U	499/597 (84%)	486 (97%)	13 (3%)	0	100	100
10	V	532/597 (89%)	519 (98%)	13 (2%)	0	100	100
11	Y	496/565 (88%)	486 (98%)	10 (2%)	0	100	100
11	Z	483/565 (86%)	475 (98%)	8 (2%)	0	100	100
12	I	710/814 (87%)	695 (98%)	15 (2%)	0	100	100
13	N	596/822 (72%)	579 (97%)	16 (3%)	1 (0%)	47	79
14	C	81/84 (96%)	78 (96%)	3 (4%)	0	100	100
All	All	7961/10291 (77%)	7752 (97%)	207 (3%)	2 (0%)	100	100

All (2) Ramachandran outliers are listed below:

WORLDWIDE
wwPDB
PROTEIN DATA BANK

Mol	Chain	Res	Type
13	N	689	VAL
1	A	591	VAL

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	1349/1720 (78%)	1322 (98%)	27 (2%)	55	80
2	D	52/115 (45%)	51 (98%)	1 (2%)	57	81
3	G	24/77 (31%)	24 (100%)	0	100	100
3	W	24/77 (31%)	24 (100%)	0	100	100
4	H	49/89 (55%)	49 (100%)	0	100	100
5	J	343/727 (47%)	329 (96%)	14 (4%)	30	66
5	P	414/727 (57%)	400 (97%)	14 (3%)	37	70
6	K	439/548 (80%)	429 (98%)	10 (2%)	50	78
6	Q	425/548 (78%)	417 (98%)	8 (2%)	57	81
7	L	163/170 (96%)	156 (96%)	7 (4%)	29	64
8	M	52/67 (78%)	49 (94%)	3 (6%)	20	55
9	O	582/650 (90%)	568 (98%)	14 (2%)	49	77
10	U	431/520 (83%)	422 (98%)	9 (2%)	53	79
10	V	464/520 (89%)	456 (98%)	8 (2%)	60	83
11	Y	423/484 (87%)	412 (97%)	11 (3%)	46	76
11	Z	412/484 (85%)	402 (98%)	10 (2%)	49	77
12	I	634/736 (86%)	624 (98%)	10 (2%)	62	84
13	N	458/724 (63%)	447 (98%)	11 (2%)	49	77
14	C	48/75 (64%)	47 (98%)	1 (2%)	53	79
All	All	6786/9058 (75%)	6628 (98%)	158 (2%)	53	78

5 of 158 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
11	Y	49	HIS
12	I	553	CYS
11	Y	130	SER
11	Z	252	ASP
13	N	238	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 61 such sidechains are listed below:

Mol	Chain	Res	Type
5	P	667	GLN
11	Z	387	ASN
6	Q	179	GLN
11	Z	262	GLN
13	N	241	HIS

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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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-17751. 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 ⓘ
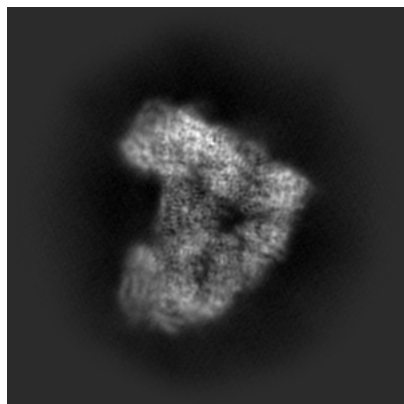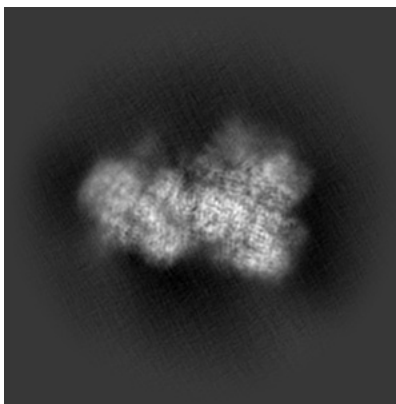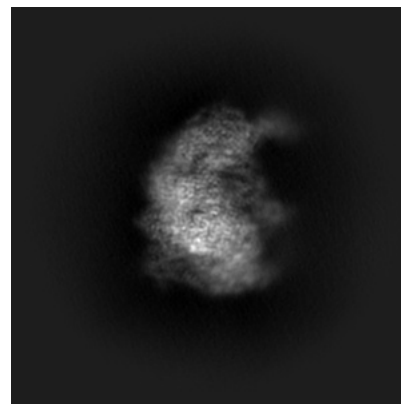
6.1.1   Primary map

X   Y   Z

6.1.2   Raw map

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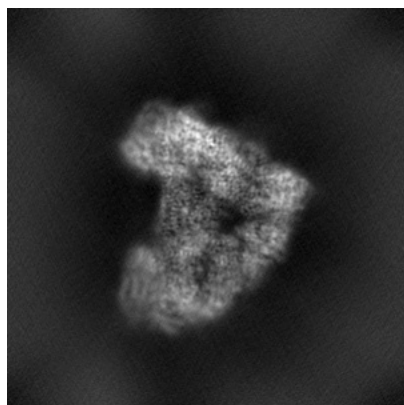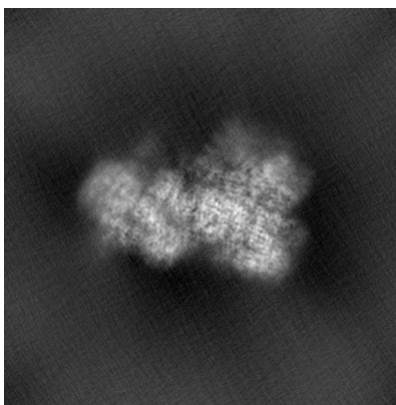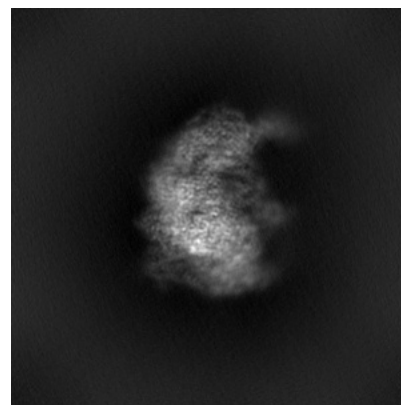
The images above show the map projected in three orthogonal directions.

6.2 Central slices ⓘ
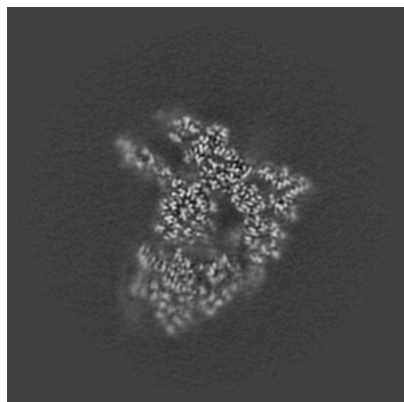
6.2.1 Primary map
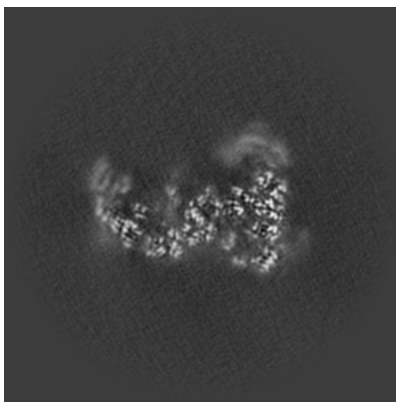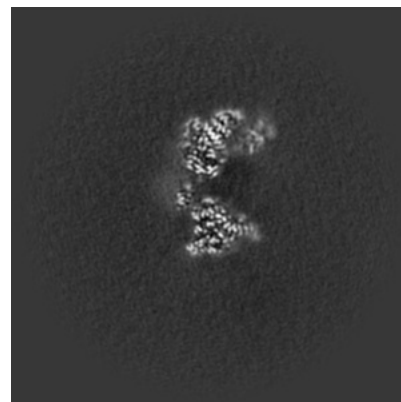
| X Index: 180 | Y Index: 180 | Z Index: 180 |

6.2.2 Raw map
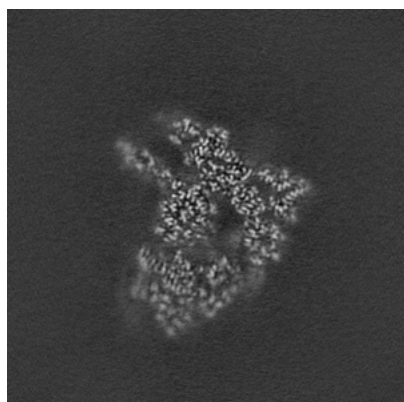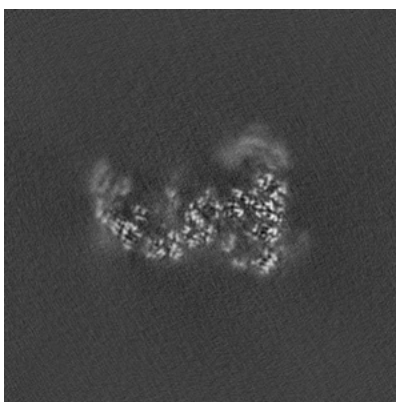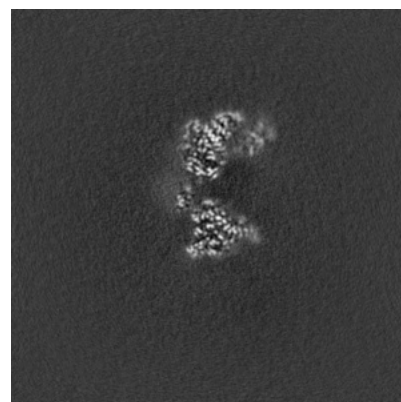
| X Index: 180 | Y Index: 180 | Z Index: 180 |

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

6.3 Largest variance slices (i)

6.3.1 Primary map
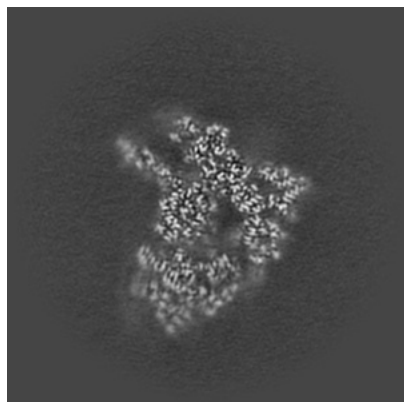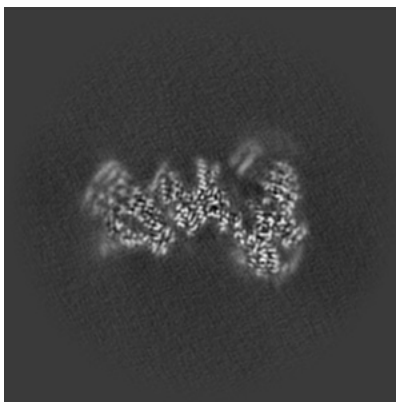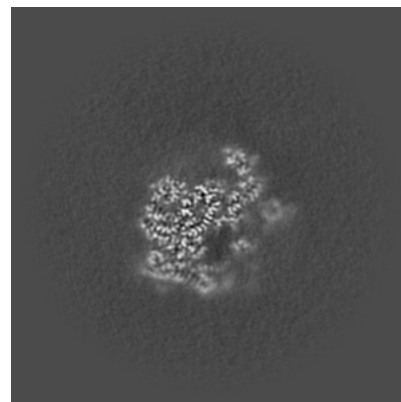
X Index: 179	Y Index: 160	Z Index: 232

6.3.2 Raw map
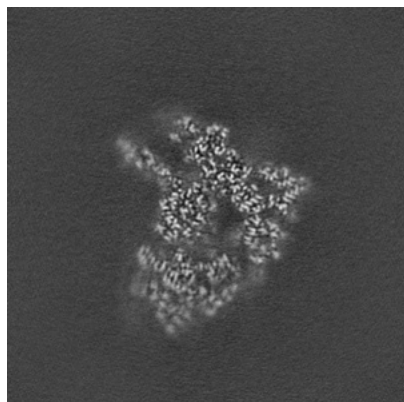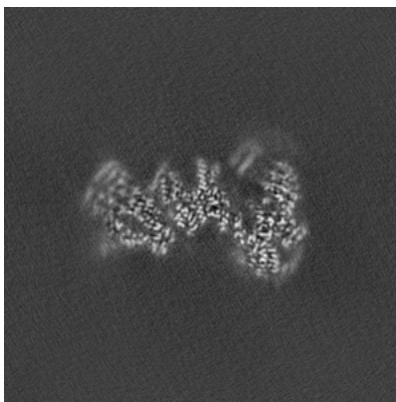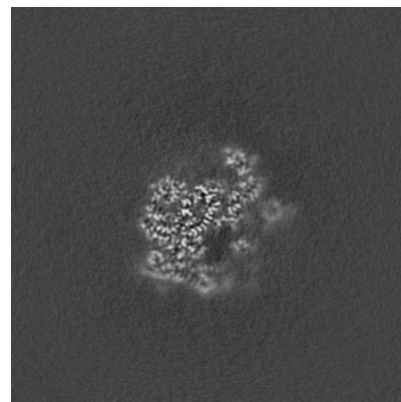
X Index: 179	Y Index: 160	Z Index: 232

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
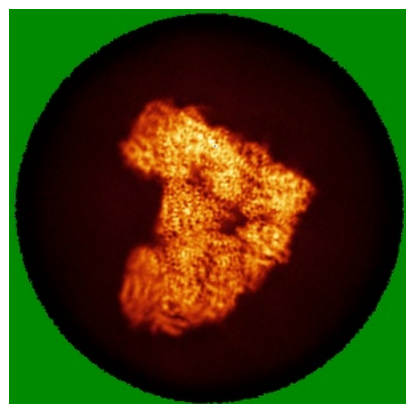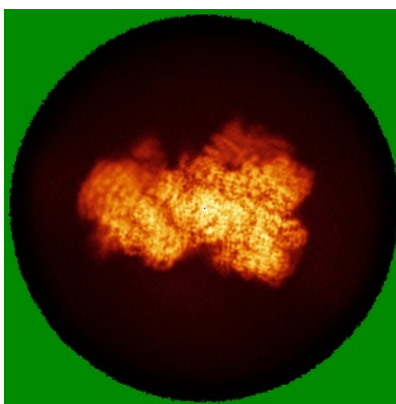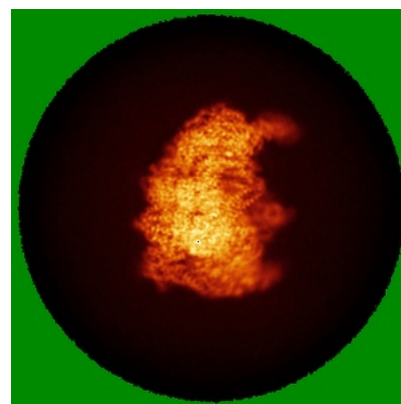
X   Y   Z

6.4.2   Raw map

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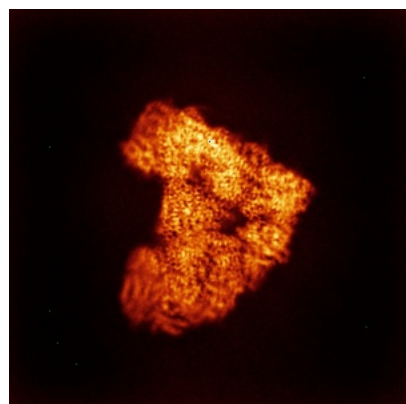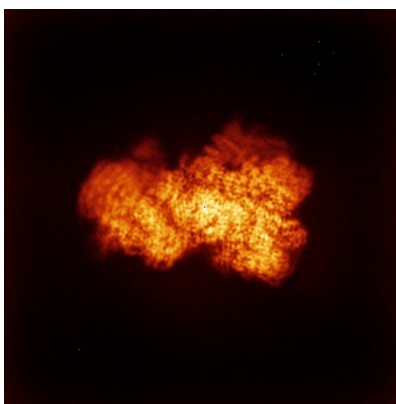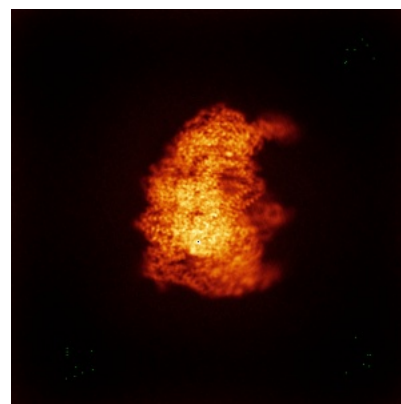
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5   Orthogonal surface views ⓘ

6.5.1   Primary map

X   Y   Z
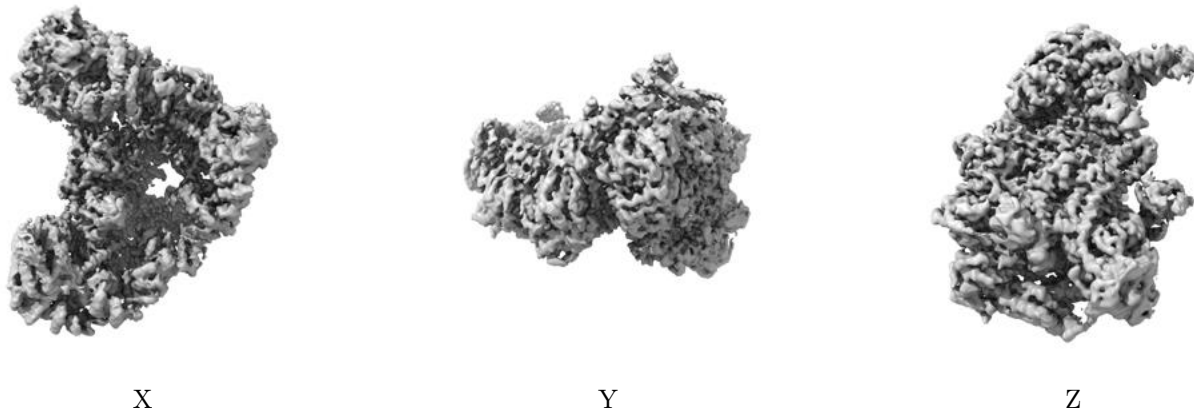
The images above show the 3D surface view of the map at the recommended contour level 0.4. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2   Raw map

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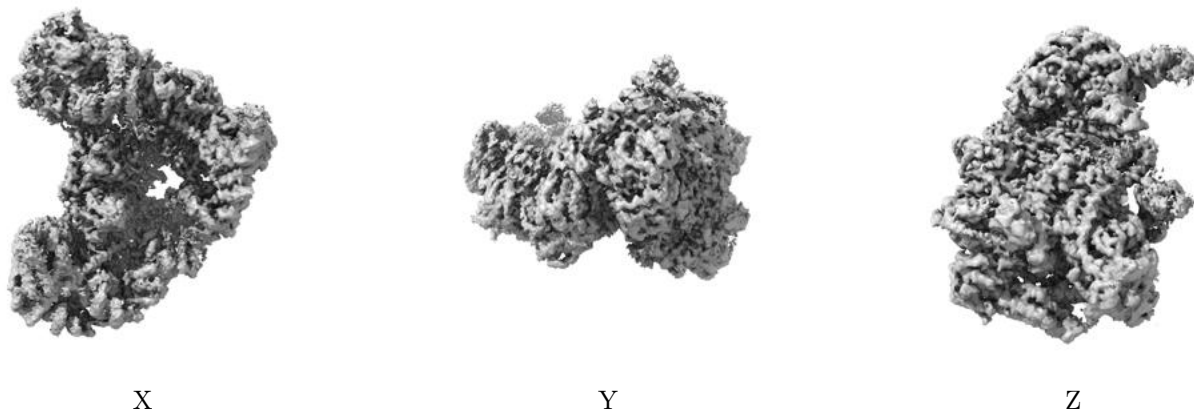
These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

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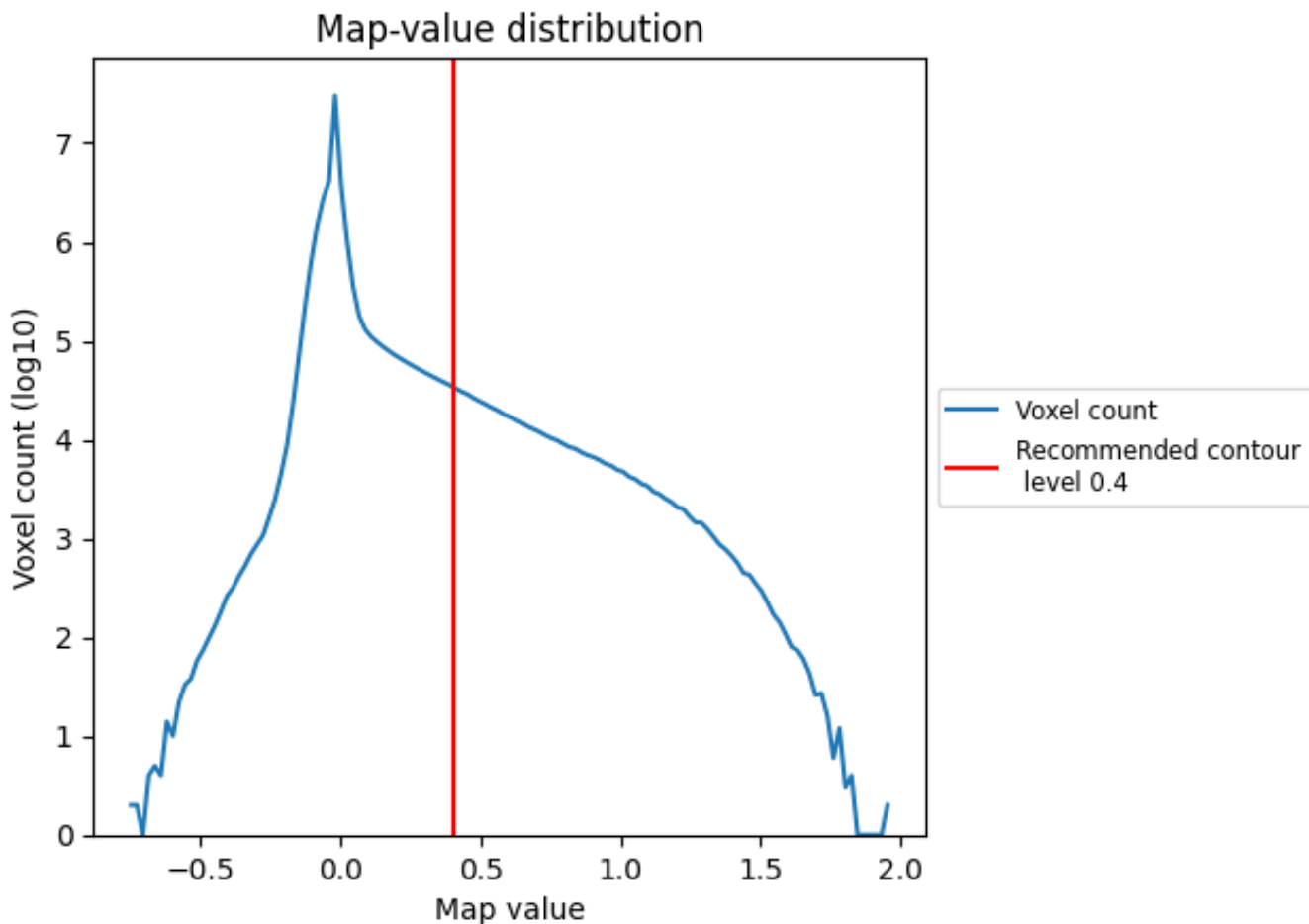
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2   Volume estimate ⓘ
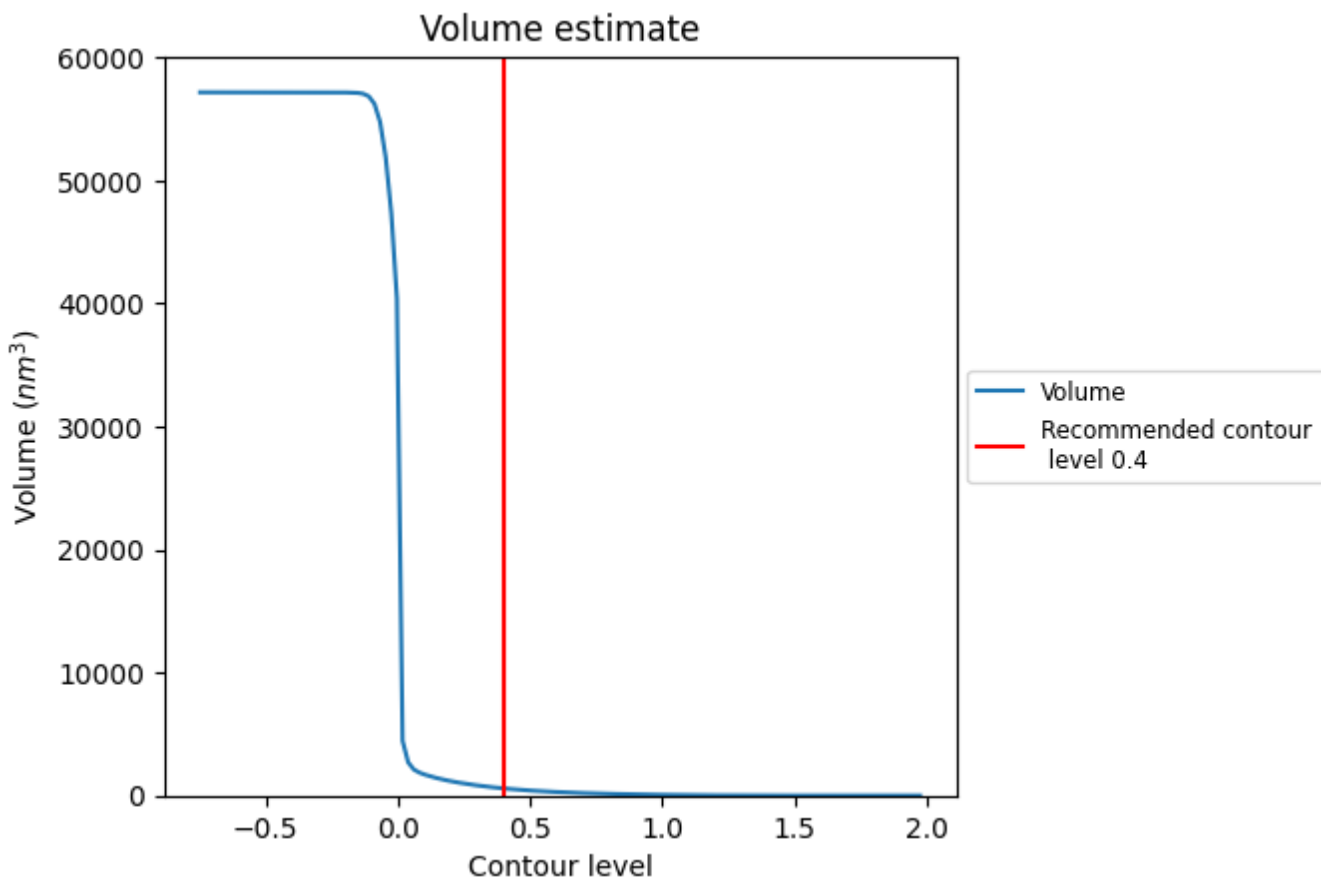
The volume at the recommended contour level is 582 nm^3; this corresponds to an approximate mass of 526 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3   Rotationally averaged power spectrum (i)
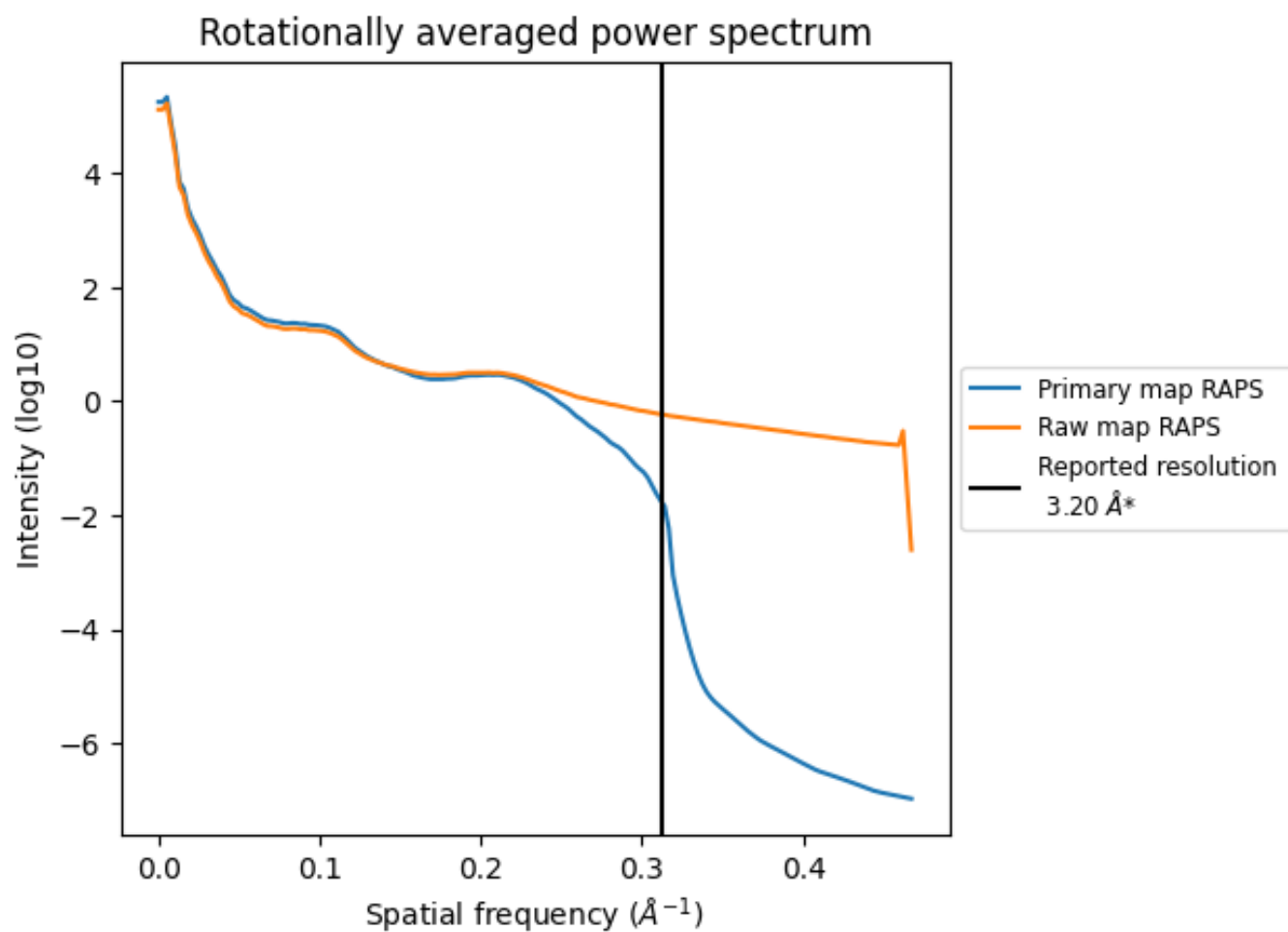
*Reported resolution corresponds to spatial frequency of 0.312 Å^{-1}

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 ⓘ
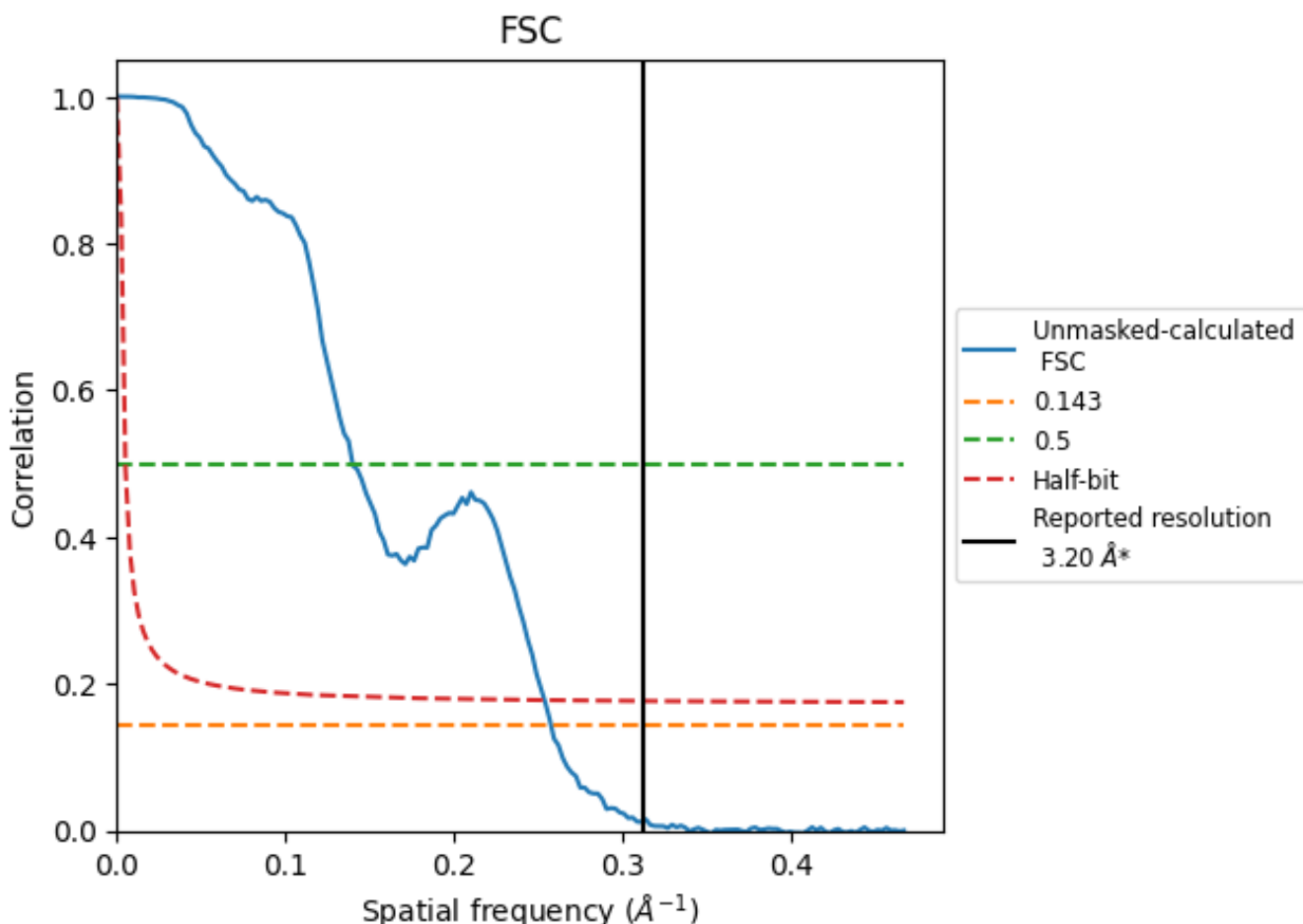
*Reported resolution corresponds to spatial frequency of 0.312 Å^{-1}

8.2　Resolution estimates ⓘ

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.20	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.88	7.14	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 3.88 differs from the reported value 3.2 by more than 10 %

9   Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-17751 and PDB model 8PKP. Per-residue inclusion information can be found in section 3 on page 7.

9.1   Map-model overlay ⓘ

X   Y   Z
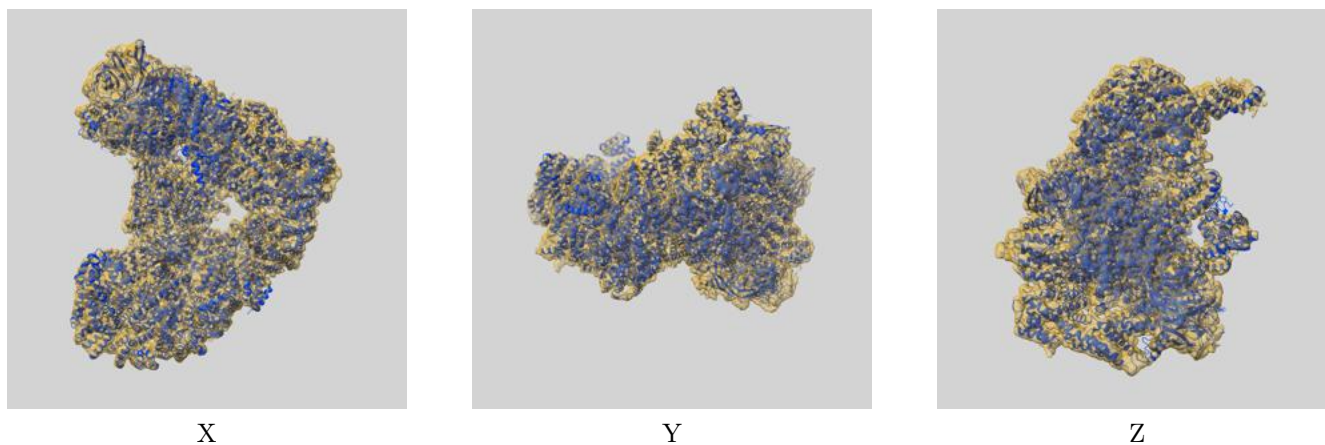
The images above show the 3D surface view of the map at the recommended contour level 0.4 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2   Q-score mapped to coordinate model (i)

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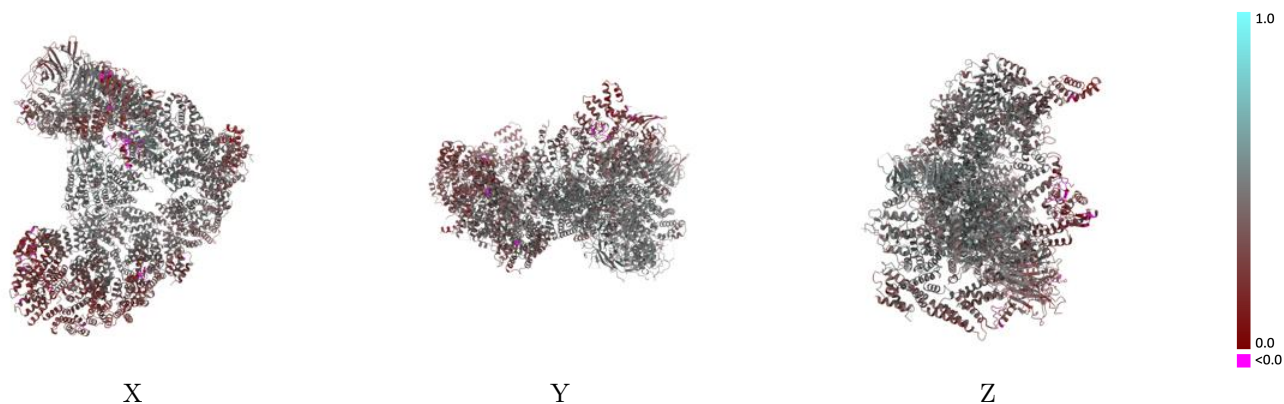
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

9.3   Atom inclusion mapped to coordinate model (i)

X   Y   Z
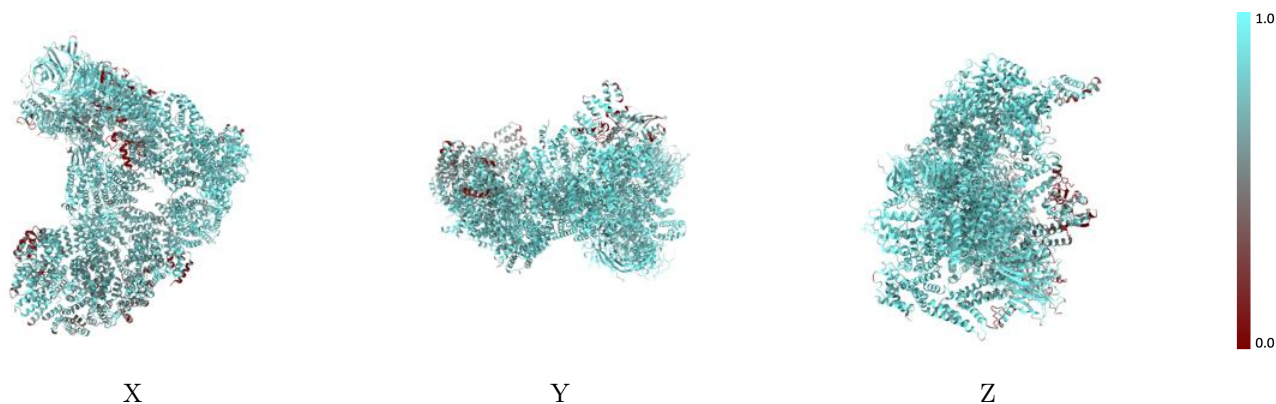
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.4).

9.4 Atom inclusion ⓘ
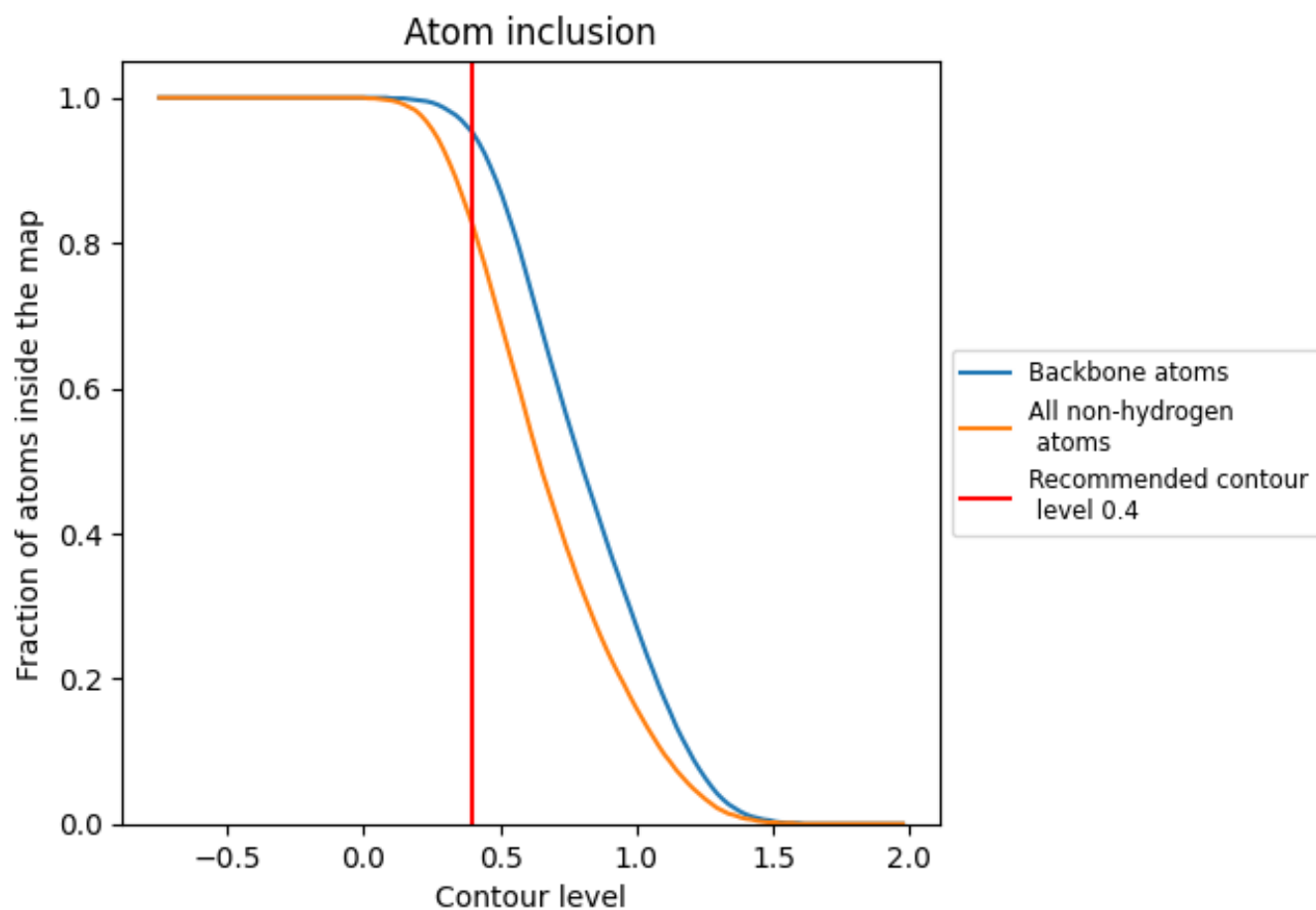
At the recommended contour level, 95% of all backbone atoms, 82% of all non-hydrogen atoms, are inside the map.

9.5　Map-model fit summary　ⓘ

The table lists the average atom inclusion at the recommended contour level (0.4) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8230	0.4120
A	0.8960	0.4790
C	0.1200	0.0950
D	0.7850	0.4610
G	0.7750	0.4240
H	0.7700	0.3860
I	0.8440	0.4220
J	0.7870	0.3830
K	0.8610	0.4400
L	0.8370	0.4390
M	0.7270	0.4500
N	0.7210	0.3460
O	0.8840	0.4750
P	0.8630	0.4310
Q	0.8640	0.4160
U	0.8490	0.4080
V	0.8800	0.4690
W	0.7800	0.4850
Y	0.6740	0.2670
Z	0.6870	0.2610

1.0

0.0
<0.0