wwPDB EM Validation Summary Report (i)

Feb 12, 2026 – 12:31 PM EST

PDB ID	:	9PD4 / pdb_00009pd4
EMDB ID	:	EMD-71525
Title	:	NER dual incision complex - DuIM
Authors	:	Li, C.L.; Kim, J.; Yang, W.
Deposited on	:	2025-06-30
Resolution	:	3.40 Å(reported)
Based on initial models	:	8ebt, 1jmc, 6tus, 6sxa, 1l1o

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		6
Ramachandran outliers		0
Sidechain outliers		1.8%

Worse   *Better*

▮ Percentile relative to all structures
▯ Percentile relative to all EM structures

Metric	Model-Map Fit Percentile Ranks	Value
Q-score		0.322

Worse   *Better*

▮ Percentile relative to all EM structures
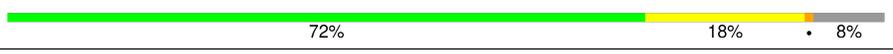▯ Percentile relative to EM structures of similar resolution
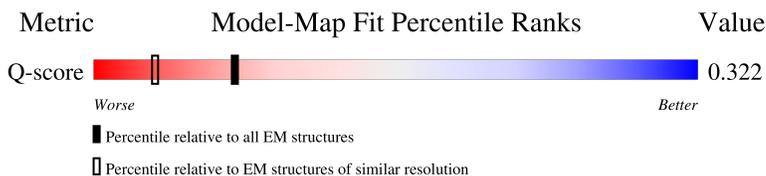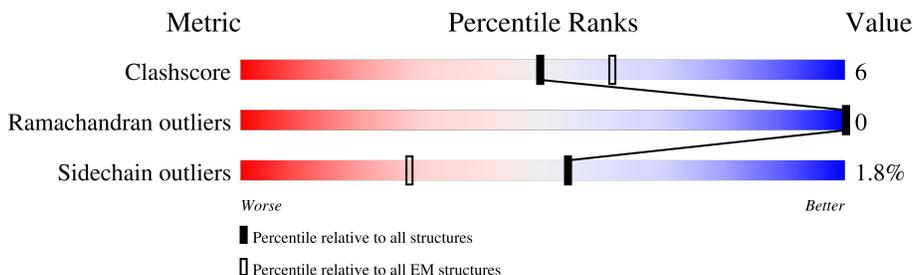
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
Q-score	-	25397	14717 (2.90 - 3.90)

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	782	62% 16% 22%
2	B	768	77% 15% • 7%
3	C	548	17% 8% 75%
4	D	462	78% 15% 6%

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Mol	Chain	Length	Quality of chain
5	E	395	72% 14% 13%
6	F	308	66% 16% 18%
7	G	71	72% 18% 8%
8	S	1186	35% 5% 61%
9	Q	916	59% 10% 31%
10	R	295	36% 6% 58%
11	K	273	6% 69% 8% 23%
12	L	93	43% 11% 46%
13	M	94	41% 13% 46%
14	N	616	61% 8% 31%
15	O	270	61% 11% 27%
16	P	121	13% 88% 12%
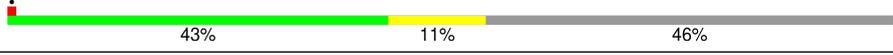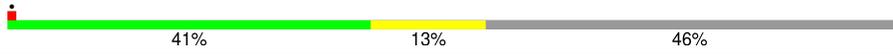
2   Entry composition   ⓘ

There are 18 unique types of molecules in this entry. The entry contains 40053 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 TFIIH basal transcription factor complex helicase XPB subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	613	Total 4947	C 3159	N 856	O 902	S 30	0	0

- Molecule 2 is a protein called General transcription and DNA repair factor IIH helicase subunit XPD.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	712	Total 5745	C 3677	N 1001	O 1038	S 29	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	761	ASP	-	expression tag	UNP P18074
B	762	TYR	-	expression tag	UNP P18074
B	763	LYS	-	expression tag	UNP P18074
B	764	ASP	-	expression tag	UNP P18074
B	765	ASP	-	expression tag	UNP P18074
B	766	ASP	-	expression tag	UNP P18074
B	767	ASP	-	expression tag	UNP P18074
B	768	LYS	-	expression tag	UNP P18074

- Molecule 3 is a protein called General transcription factor IIH subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	138	Total 1130	C 718	N 196	O 209	S 7	0	0

- Molecule 4 is a protein called General transcription factor IIH subunit 4, p52.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	434	Total 3483	C 2245	N 605	O 620	S 13	0	0

- Molecule 5 is a protein called General transcription factor IIH subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	343	Total 2686	C 1697	N 457	O 506	S 26	0	0

- Molecule 6 is a protein called General transcription factor IIH subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	254	Total 2001	C 1280	N 332	O 370	S 19	0	0

- Molecule 7 is a protein called General transcription factor IIH subunit 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	65	Total 515	C 332	N 81	O 99	S 3	0	0

- Molecule 8 is a protein called DNA excision repair protein ERCC-5.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	S	466	Total 3829	C 2440	N 653	O 723	S 13	2	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
S	812	ASN	ASP	engineered mutation	UNP P28715
S	1053	ARG	GLY	variant	UNP P28715
S	1080	ARG	GLY	variant	UNP P28715

- Molecule 9 is a protein called DNA repair endonuclease XPF.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	Q	632	Total 5001	C 3204	N 866	O 909	S 22	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
Q	703	ASP	GLY	variant	UNP Q92889

- Molecule 10 is a protein called DNA excision repair protein ERCC-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	R	123	Total	C	N	O	S	0	0
			983	637	167	175	4		

- Molecule 11 is a protein called DNA repair protein complementing XP-A cells.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	K	209	Total	C	N	O	S	0	0
			1724	1078	309	321	16		

- Molecule 12 is a DNA chain called DNA (Cy5).

Mol	Chain	Residues	Atoms					AltConf	Trace
12	L	50	Total	C	N	O	P	0	0
			1031	506	175	300	50		

- Molecule 13 is a DNA chain called DNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	M	51	Total	C	N	O	P	0	0
			1055	503	196	305	51		

- Molecule 14 is a protein called Replication protein A 70 kDa DNA-binding subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	N	427	Total	C	N	O	S	0	0
			3420	2154	583	666	17		

- Molecule 15 is a protein called Replication protein A 32 kDa subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	O	197	Total	C	N	O	S	0	0
			1538	968	262	300	8		

- Molecule 16 is a protein called Replication protein A 14 kDa subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	P	121	Total	C	N	O	S	0	0
			950	610	155	177	8		

- Molecule 17 is IRON/SULFUR CLUSTER (CCD ID: SF4) (formula: Fe_4S_4).
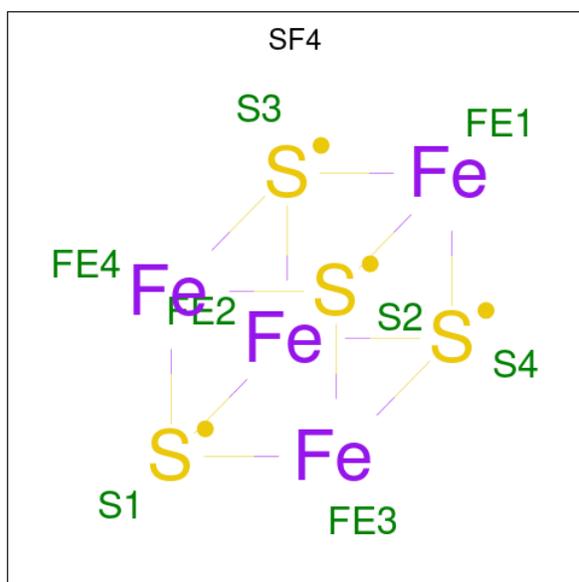
Mol	Chain	Residues	Atoms			AltConf
17	B	1	Total	Fe	S	0
			8	4	4	

- Molecule 18 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
18	E	3	Total	Zn	0
			3	3	
18	F	2	Total	Zn	0
			2	2	
18	K	1	Total	Zn	0
			1	1	
18	N	1	Total	Zn	0
			1	1	

3   Residue-property plots ⓘ

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: TFIIH basal transcription factor complex helicase XPB subunit

Chain A:

• Molecule 2: General transcription and DNA repair factor IIH helicase subunit XPD

Chain B:

F357 L361 C366 I367 R378 P396 T415 I416 I417 I418 D422 D423 R424 T425 P431 F435 D439 A440 S441 L442 A443 I444 F448 V454 I455 I456 T457 S458 I466 K469 M483 T484 L485 A486 D513 V516 L523 E526 I535 M545

I669 E570 T571 T577 L581 E589 I595 R601 V604 I608 V611 H612 H613 Y614 I619 I632 L637 E648 N649 T653 F654 D655 R658 V678 R686 K689 K692 L693 P694 R695 W696 V710 V714 F720 M724 A725

Q733 L738 LEU SER LEU GLU GLN LEU GLU SER GLU GLU THR LEU LYS ARG ILE GLU GLN ILE ALA GLN GLN LEU ASP TYR LYS ASP ASP ASP LYS

• Molecule 3: General transcription factor IIH subunit 1

Chain C:

17% 8% 75%

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

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

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

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

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

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

GLU ASP LEU GLY LYS ASN ASN SER VAL LYS THR ILE ALA LEU ASN LEU LYS LYS SER ASP ARG TYR HIS GLY PRO THR PRO ILE GLN LEU SER LEU GLN TYR ALA THR ◆S397 ◆Q398 ◆D399 I400 I401 S406 I407 R408 Q409 E410 M411 E412 A413 Y414 V421 S428 T431 P436 GLY

GLY ALA LEU MET GLN GLY GLY THR GLN GLN ALA ILE ASN Q451 M452 V453 P454 I457 L461 Y465 V466 E470 F475 W476 ◆V481 M482 L486 E487 K494 F500 Q501 V502 T503 K504 L505 C506 P507 F508 Q509 E510 K511 I512 ◆Y516 L517 S518 ◆T519 N520 L521 I525
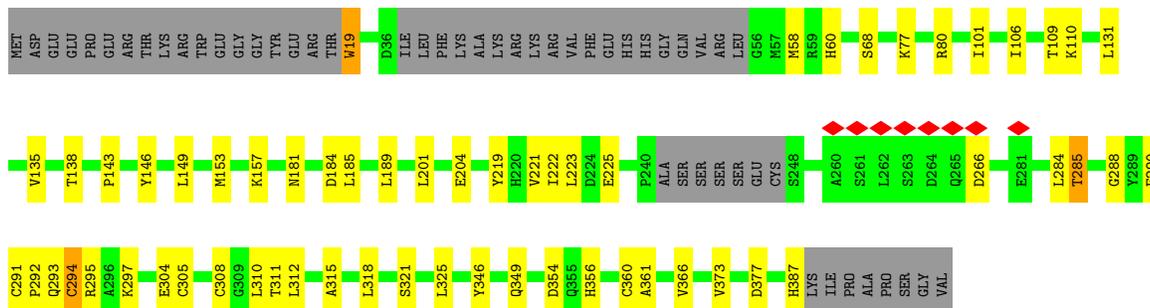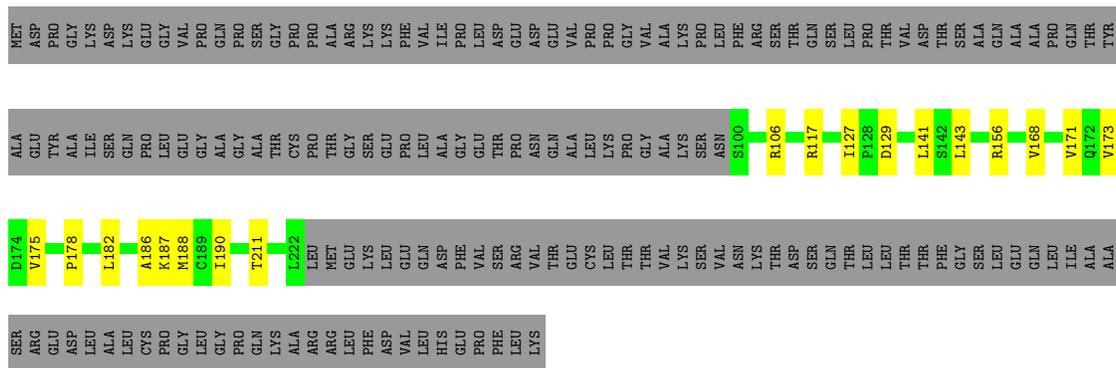
E526 E527 M528 T531 K535 L536 ◆L544 ◆M545 ◆K546 ◆K547 ◆T548

• Molecule 4: General transcription factor IIH subunit 4, p52

Chain D:

78% 15% 6%

MET GLU SER THR PRO SER ARG GLY LEU ASN ARG VAL HIS LEU GLN CYS R17 N18 L19 Q20 E21 L34 Y35 G36 T40 A43 E47 M59 L62 P65 K76 F79 I95 W96 H97 L101 P102 ◆G103 G104 L105 I109 L110 N117 D132 T133

K140 H141 A152 V164 ◆A170 V171 L175 L179 L184 M185 I196 Q202 L205 L206 D207 L212 W213 Y219 Q224 E232 S255 L258 H264 L265 L270 V271 T284 I288 N289 L290 S291 S292 GLY VAL SER GLY ALA GLY THR VAL

WORLDWIDE
wwPDB
PROTEIN DATA BANK

HIS GLN PRO G305 V308 V309 Y313 Y316 A317 Y318 M334 R337 F338 P339 N340 M341 Q345 Q352 I355 Q363 M376 T380 I387 R400 L401 R402 Y409 L413 S414 E419 L420 L421 R426 E427 L428 G429 A437 L440 A446 G447

H448 V451 K456 R457 Q458 K459 H460 S461 S462

• Molecule 5: General transcription factor IIH subunit 2

Chain E:
72%   14%   •   13%

MET ASP GLU GLU PRO GLU ARG THR LYS ARG TRP GLU GLY TYR GLU ARG THR W19 D36 ILE LEU PHE LYS ALA LYS ARG LYS ARG VAL PHE GLU HIS HIS GLY VAL GLN ARG LEU G56 M57 M58 R59 H60 S68 K77 R80 I101 I106 T109 K110 L131

V135 T138 P143 Y146 L149 M153 K157 N181 D184 L185 L189 L201 E204 Y219 H220 V221 I222 L223 D224 E225 P240 ALA SER SER SER GLU CYS S248 A260 S261 L262 S263 D264 Q265 D266 E281 L284 T285 G288 Y289 F290

C291 P292 Q293 C294 R295 A296 K297 E304 C305 C308 G309 L310 T311 L312 A315 L318 S321 L325 Y346 Q349 D354 Q355 H356 C360 A361 V366 V373 D377 H387 LYS ILE PRO ALA PRO SER GLY VAL

• Molecule 6: General transcription factor IIH subunit 3

Chain F:
66%   16%   18%

MET VAL SER ASP GLU D6 L10 L11 V12 V15 G23 A26 E29 I38 M42 H48 M51 N52 R53 K56 L57 A58 V59 I60 A61 S67 R68 F69 L70 Y71 PRO GLY LYS ASN GLY ARG LEU GLY ASP PHE PHE GLY ASP PRO GLY ASN PRO GLU

PHE ASN PRO SER GLY SER LYS ASP GLY LYS TYR E102 I124 T131 L137 A138 K139 V151 Q155 S159 I164 D169 Q173 Y174 M175 N176 F177 V180 I181 I189 A193 C194 L203 C207 D208 G212 L215 Y226 V230 P244 P245

V249 C255 I264 C276 F289 LYS ILE SER LEU PRO PRO VAL LEU LYS ALA LYS LYS LYS LEU LYS VAL SER ALA

• Molecule 7: General transcription factor IIH subunit 5

Chain G:
72%   18%   •   8%

MET VAL ASN VAL L5 E11 M16 K17 Q18 F19 D24 K31 K32 F33 I34 I38 V43 F44 V45 I46 L49 T69 GLN LYS

• Molecule 8: DNA excision repair protein ERCC-5

Chain S:
35%   5%   61%

MET G2 K8 E11 L27 S32 L35 G41 VAL ARG ASP ARG HIS GLY ASN S49 R69 D77 G78 D79 A80 P81 L82 L83 Q93 ARG LYS ASP LEU ALA SER SER ASP SER ARG LYS THR THR GLU LEU LEU LYS THR PHE LEU LYS ARG GLN ALA ILE

• Molecule 9: DNA repair endonuclease XPF

Chain Q:

59%   10%   31%

R153 K162 A163 A168 F171 F175 C176 H177 L185 V211 V216 M222 I225 Q226 K241 L252 W274 L277 T281 LYS SER LEU VAL V285 D302 C303 R342 VAL TYR HIS LEU PRO ASP ALA LYS MET SER LYS LYS GLU LYS ILE SER GLU

LYS MET GLU ILE LYS GLU GLY GLU GLU THR LYS LYS GLU LEU VAL L375 P379 K380 W381 E386 K389 A400 L401 I409 D414 Y423 A428 F440 GLU LYS ASP SER LYS ALA GLU GLU VAL TRP MET LYS PHE ARG GLU ASP SER SER LYS ARG ILE ARG

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

SER CYS PRO GLU ILE LYS HIS GLU GLU GLU PHE ASP ASN LEU SER SER ASP ALA ALA PHE GLY ILE LEU LYS LYS PRO L551 I554 D562 A565 L570 H571 V579 L580 Y581 ASP ALA E584 F587 V588 R589 E592 R598 PRO GLY K601 V605 S613

E636 M640 V641 V642 E647 G659 THR ALA SER ASP VAL ALA SER THR ASP THR ARG LYS GLY GLY GLU GLN ASN GLY THR Q681 D687 M688 F691 V709 Y716 P720 V724 E725 R726 K727 S728 I729 L732 I733 G734 S735 L736 L741 L758

P766 PHE SER LEU THR SER ARG GLY ALA LEU PHE GLN GLU ILE SER ASN ASP I784 S785 S786 K787 L801 W802 C803 P806 T809 P823 D824 A825 A828 LEU ALA ILE THR ALA ASP SER GLU THR LEU PRO GLY SER GLU LYS TYR ASN PRO GLY PRO GLN ASP PHE LEU

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

LYS GLY LYS LYS

• **Molecule 10: DNA excision repair protein ERCC-1**

Chain R: 36%   6%   58%

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

ALA GLU TYR ALA ILE SER GLU GLN PRO LEU GLU GLY GLY ALA GLY ALA THR CYS PRO THR GLY SER GLU LEU PRO LEU ALA GLY GLU GLY THR PRO ASN GLN LEU LYS PRO GLY LYS ALA LYS SER ASN S100 R106 R117 I127 P128 D129 L141 S142 L143 R156 V168 V171 Q172 V173

D174 V175 P178 L182 A186 K187 M188 C189 I190 T211 L222 LEU MET LEU LYS LEU GLU GLN ASP PHE VAL SER ARG VAL THR GLU CYS LEU THR THR VAL LYS SER VAL ASN LYS THR ASP SER GLN LEU THR LEU LEU THR PHE GLY SER LEU GLU GLU GLN LEU ILE ALA ALA

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

• **Molecule 11: DNA repair protein complementing XP-A cells**

6%

Chain K: 69%   8%   23%

MET ALA ALA ALA ASP GLY ALA LEU PRO GLU GLY ALA ALA ALA LEU GLU GLU PRO ALA GLU LEU PRO A22 R25 I28 A45 ARG PRO TYR SER ALA THR ALA ALA ALA THR GLY GLY MET SER ASN VAL LYS ALA ALA PRO LYS ILE I69 D70 E78 GLU GLU GLU GLU GLU

GLU GLN LYS ILE G88 K89 E99 C108 L123 P124 C129 R158 F164 P170 H171 H172 W175 K179 R189 E205 Q208 E209 K213 V230 ARG SER SER VAL TRP LYS ARG GLU THR ILE VAL H242 E245 Y246 G247 P248 E249 E250 N251 L252 E253

D254 D255 R258 T262 L268 K272 M273

• Molecule 12: DNA (Cy5)

Chain L: 43% 11% 46%

DG DC DT DG DC DG DG DT DC DC DG DT DT DG DA DC DG DA DC DA DA DT DA DC DA DG DC T27 G32 A33 T34 G35 C36 C37 A38 C39 T40 T41 C42 T53 G57 C64 G76 DA DT DA DC DG DC DC DT DG DG DC

DT DC DG DA

• Molecule 13: DNA

Chain M: 41% 13% 46%

DT DC DG DA DG DC DC DG DA DG DG DC DG DT DA DG DT C18 G19 T20 A21 A34 A45 T49 A50 C51 T52 G53 G58 G59 C63 A68 DG DC DT DG DT DA DT DG DT DC DC DT DA DA DC DG DG DA DC DC DG

DC DA DG DC

• Molecule 14: Replication protein A 70 kDa DNA-binding subunit

Chain N: 61% 8% 31%

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

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

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

GLN SER K183 I187 L190 I199 C200 A201 W212 S213 N214 K220 L224 A235 N239 E240 Q241 F245 K273 V298 D301 C323 D328 K331 I332 E340 K343 Y347 L348 M349 D350 T351 V355 D369 Q373 V393 I399

D404 L411 R412 G413 W414 A417 E418 A421 L422 D423 S426 K431 S432 GLY GLY VAL GLY GLY SER ASN T440 V448 L453 V465 R472 M477 Q494 Y512 L516 W528 E560 N564 V574 K577 V578 E579 N582 V591

V594 R604 M608 R611 L615 M616

• Molecule 15: Replication protein A 32 kDa subunit

Chain O: 61% 11% 27%

MET TRP ASN SER GLY PHE GLU SER TYR GLY SER SER SER TYR GLY GLY ALA GLY GLY TYR THR GLN SER PRO GLY GLY PHE GLY SER PRO ALA PRO SER GLN ALA GLU LYS LYS SER ARG ALA ARG ALA GLN **H45** I46 Q53 A57 V69 I79 E84 D95 V104

R105 Q106 D111 D112 T113 S114 T118 Y125 V126 G130 F135 Q136 K139 S140 L141 V142 A143 F144 K145 I146 L169 S174 GLN PRO SER ALA GLY ARG ALA PRO ILE SER ASN PRO GLY MET SER GLU ALA GLY ASN PHE GLY GLY ASN SER PHE MET PRO ALA ASN G204

V207 Q211 E223 N226 F227 S240 Q244 T258 V259 D260 D261 D262 H263 A269 E270

• Molecule 16: Replication protein A 14 kDa subunit

Chain P:

M1 V2 D3 R9 S10 R11 I12 M16 Q19 P36 T37 G46 E47 G48 I53 D60 E61 E62 V69 T74 A75 K76 Q86 D90 L96 Y99 P114 V118 Q119 H120 D121

4   Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	140332	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{Å}^2)$	52.5	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2400	Depositor
Magnification	105000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.052	Depositor
Minimum map value	-0.009	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.002	Depositor
Recommended contour level	0.006	Depositor
Map size (Å)	266.56, 266.56, 266.56	wwPDB
Map dimensions	320, 320, 320	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.833, 0.833, 0.833	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, SF4, VM6

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	0.09	0/5051	0.25	0/6822
2	B	0.09	0/5868	0.25	0/7941
3	C	0.10	0/1152	0.26	0/1553
4	D	0.08	0/3564	0.19	0/4827
5	E	0.09	0/2745	0.25	0/3718
6	F	0.08	0/2036	0.21	0/2758
7	G	0.09	0/521	0.27	0/703
8	S	0.09	0/3913	0.23	0/5275
9	Q	0.08	0/5097	0.21	0/6916
10	R	0.08	0/1007	0.21	0/1370
11	K	0.08	0/1752	0.22	0/2335
12	L	0.16	0/1109	0.35	0/1704
13	M	0.15	0/1185	0.33	0/1829
14	N	0.09	0/3483	0.24	0/4702
15	O	0.09	0/1564	0.24	0/2124
16	P	0.08	0/970	0.21	0/1310
All	All	0.09	0/41017	0.24	0/55887

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.

W O R L D W I D E
wwPDB
PROTEIN DATA BANK

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4947	0	4993	79	0
2	B	5745	0	5787	66	0
3	C	1130	0	1147	29	0
4	D	3483	0	3526	47	0
5	E	2686	0	2644	38	0
6	F	2001	0	2021	32	0
7	G	515	0	522	12	0
8	S	3829	0	3743	29	0
9	Q	5001	0	4971	52	0
10	R	983	0	993	10	0
11	K	1724	0	1716	13	0
12	L	1031	0	554	10	0
13	M	1055	0	577	8	0
14	N	3420	0	3354	28	0
15	O	1538	0	1536	16	0
16	P	950	0	952	8	0
17	B	8	0	0	0	0
18	E	3	0	0	0	0
18	F	2	0	0	0	0
18	K	1	0	0	0	0
18	N	1	0	0	0	0
All	All	40053	0	39036	437	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 6.

The worst 5 of 437 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:E:294:CYS:SG	5:E:305:CYS:HB2	2.19	0.82
5:E:291:CYS:HB3	5:E:312:LEU:HD21	1.63	0.81
5:E:285:THR:HG23	5:E:297:LYS:HD2	1.64	0.79
10:R:141:LEU:HB3	10:R:171:VAL:HG12	1.66	0.78
15:O:104:VAL:HG12	15:O:141:LEU:HB3	1.66	0.77

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	609/782 (78%)	577 (95%)	32 (5%)	0	100	100
2	B	708/768 (92%)	691 (98%)	17 (2%)	0	100	100
3	C	134/548 (24%)	131 (98%)	3 (2%)	0	100	100
4	D	430/462 (93%)	426 (99%)	4 (1%)	0	100	100
5	E	337/395 (85%)	325 (96%)	12 (4%)	0	100	100
6	F	250/308 (81%)	246 (98%)	4 (2%)	0	100	100
7	G	63/71 (89%)	56 (89%)	7 (11%)	0	100	100
8	S	456/1186 (38%)	445 (98%)	11 (2%)	0	100	100
9	Q	616/916 (67%)	603 (98%)	13 (2%)	0	100	100
10	R	121/295 (41%)	117 (97%)	4 (3%)	0	100	100
11	K	201/273 (74%)	192 (96%)	9 (4%)	0	100	100
14	N	423/616 (69%)	409 (97%)	14 (3%)	0	100	100
15	O	193/270 (72%)	189 (98%)	4 (2%)	0	100	100
16	P	119/121 (98%)	118 (99%)	1 (1%)	0	100	100
All	All	4660/7011 (66%)	4525 (97%)	135 (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	542/688 (79%)	529 (98%)	13 (2%)	44	66
2	B	623/672 (93%)	604 (97%)	19 (3%)	36	61
3	C	131/484 (27%)	126 (96%)	5 (4%)	28	54
4	D	377/399 (94%)	374 (99%)	3 (1%)	79	87
5	E	307/352 (87%)	296 (96%)	11 (4%)	30	56
6	F	227/272 (84%)	225 (99%)	2 (1%)	75	86
7	G	58/64 (91%)	57 (98%)	1 (2%)	56	74
8	S	418/1050 (40%)	415 (99%)	3 (1%)	81	88
9	Q	535/816 (66%)	529 (99%)	6 (1%)	70	81
10	R	107/252 (42%)	104 (97%)	3 (3%)	38	62
11	K	188/233 (81%)	188 (100%)	0	100	100
14	N	379/530 (72%)	373 (98%)	6 (2%)	58	75
15	O	178/228 (78%)	176 (99%)	2 (1%)	70	81
16	P	106/106 (100%)	104 (98%)	2 (2%)	52	71
All	All	4176/6146 (68%)	4100 (98%)	76 (2%)	54	73

5 of 76 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
9	Q	91	GLU
14	N	611	ARG
9	Q	175	PHE
10	R	173	VAL
16	P	96	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 58 such sidechains are listed below:

Mol	Chain	Res	Type
7	G	54	GLN
15	O	211	GLN
8	S	802	GLN
15	O	209	GLN
14	N	241	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 ⓘ

Of 8 ligands modelled in this entry, 7 are monoatomic - leaving 1 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#|Z| > 2$	Counts	RMSZ	$\#|Z| > 2$
17	SF4	B	1000	2	0,12,12	-	-	-		

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
17	SF4	B	1000	2	-	-	0/6/5/5

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-71525. 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 ⓘ
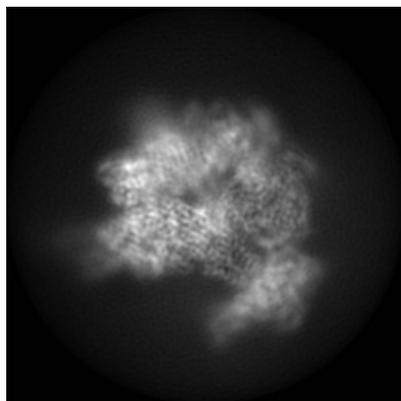
6.1.1 Primary map

X
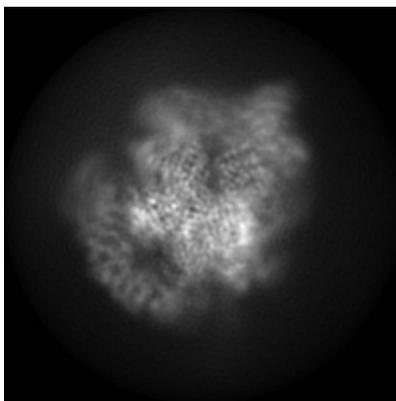
Y
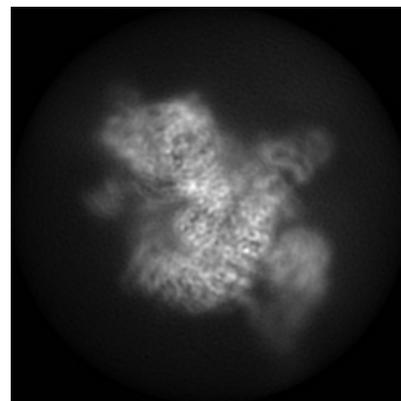
Z

6.1.2 Raw map

X

Y

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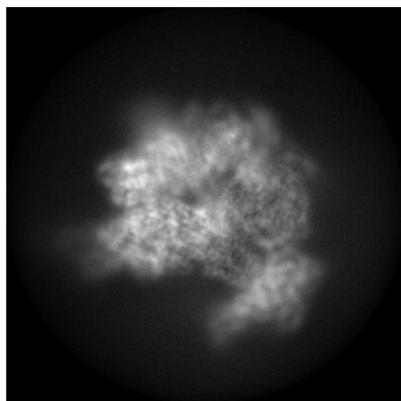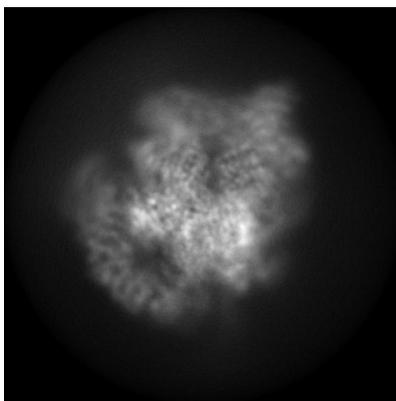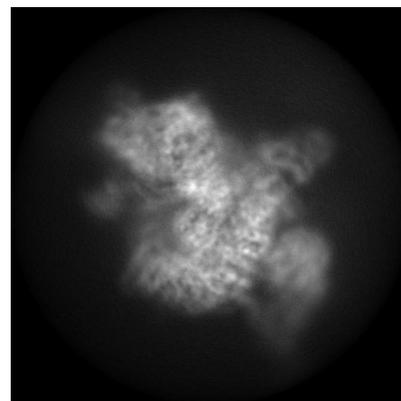
The images above show the map projected in three orthogonal directions.

6.2 Central slices ⓘ
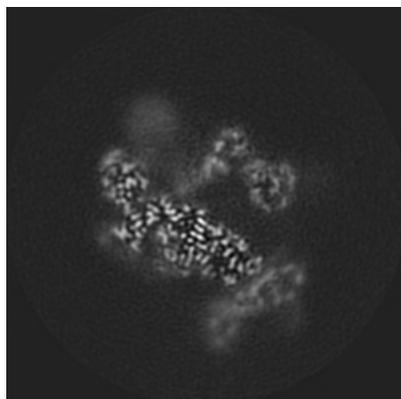
6.2.1 Primary map
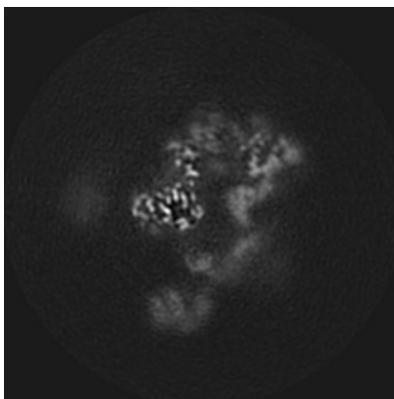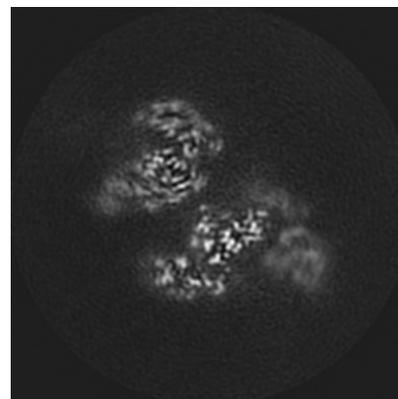
X Index: 160   Y Index: 160   Z Index: 160

6.2.2 Raw map
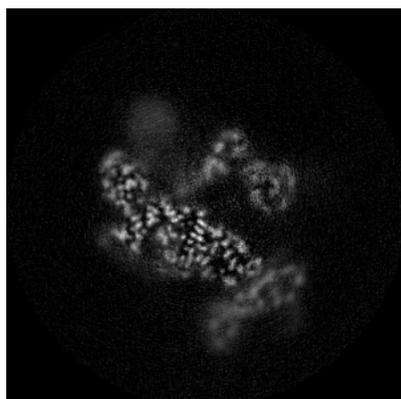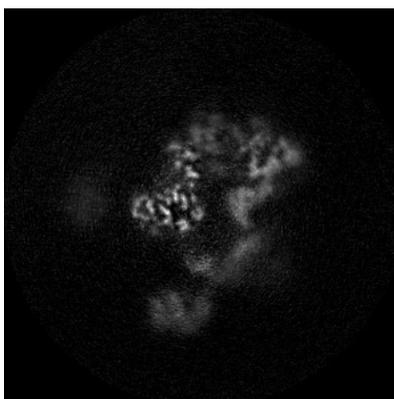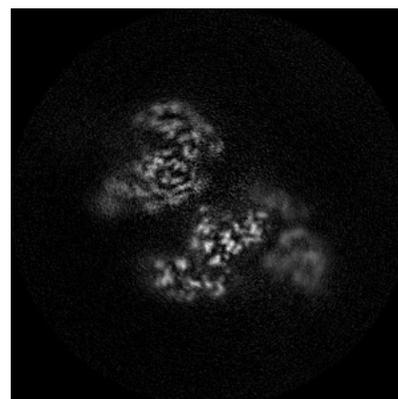
X Index: 160   Y Index: 160   Z Index: 160

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

6.3   Largest variance slices ⓘ

6.3.1   Primary map
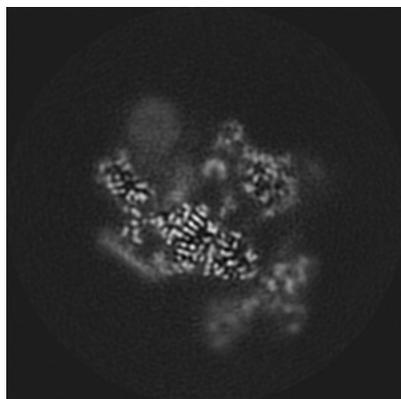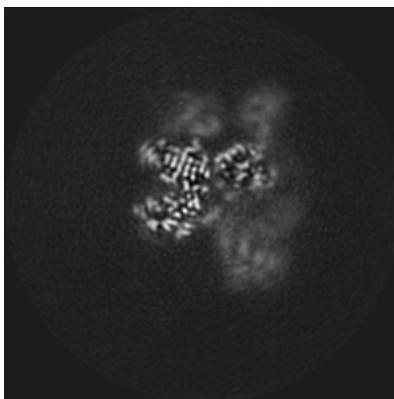
| X Index: 153 | Y Index: 134 | Z Index: 147 |
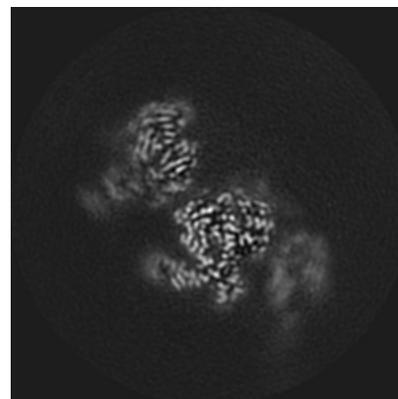
6.3.2   Raw map
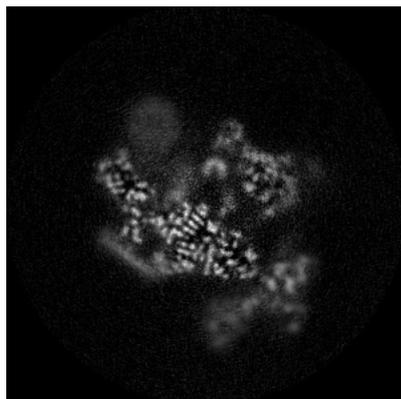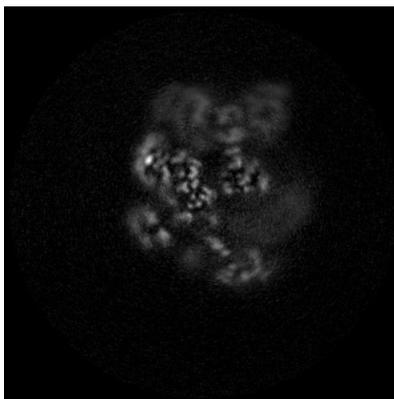
| X Index: 153 | Y Index: 120 | Z Index: 146 |
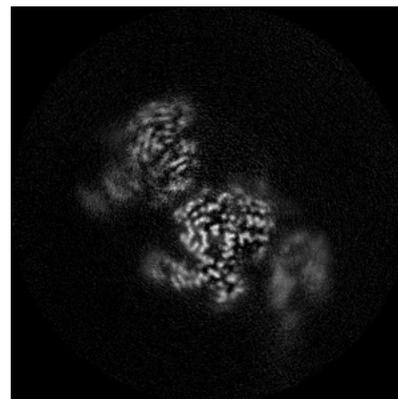
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map
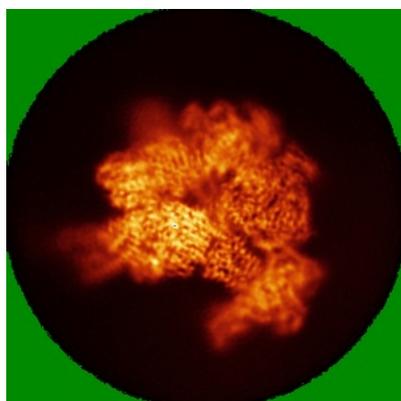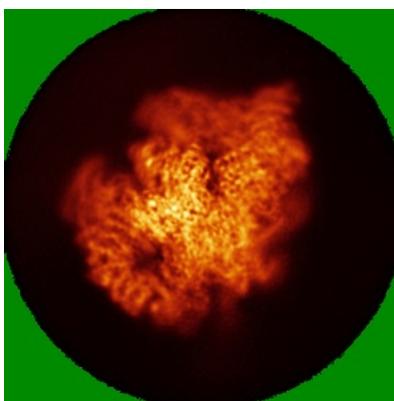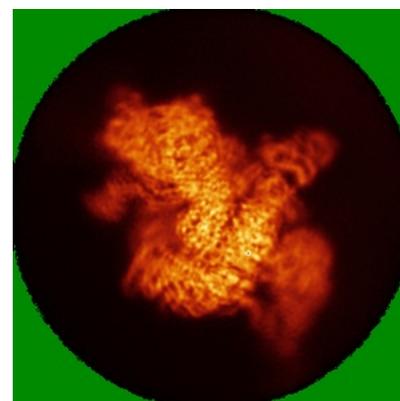
X   Y   Z

6.4.2 Raw map

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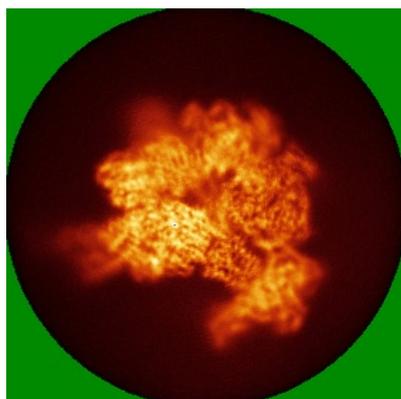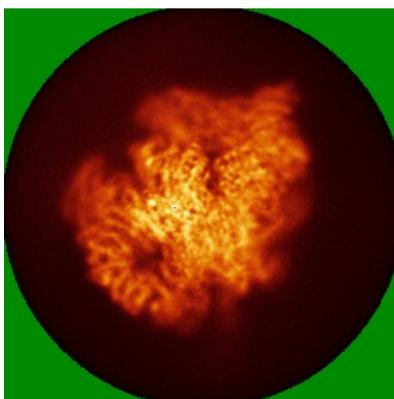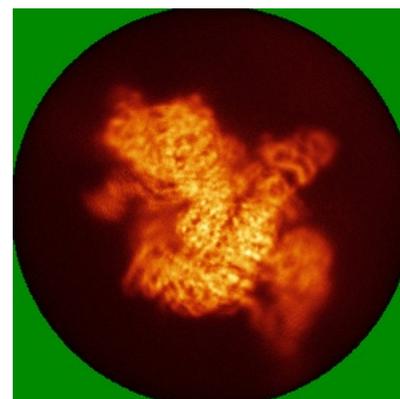
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5   Orthogonal surface views (i)

6.5.1   Primary map

X   Y   Z

The images above show the 3D surface view of the map at the recommended contour level 0.006. 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
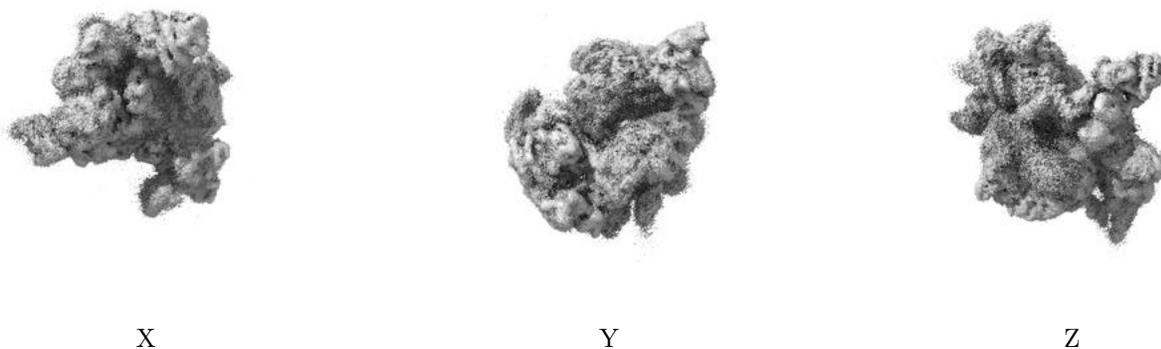
These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

6.6   Mask visualisation (i)

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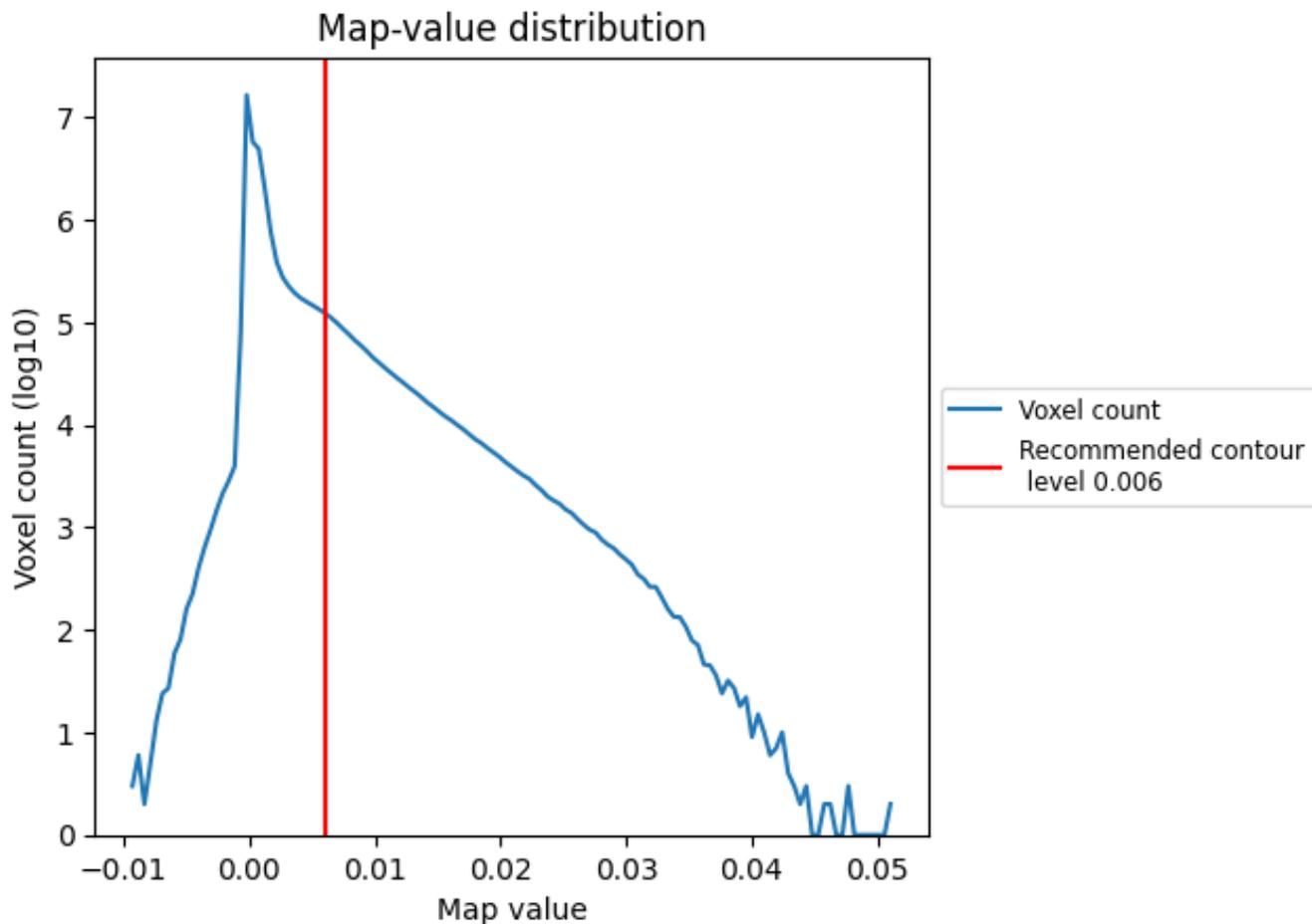
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2　Volume estimate ⓘ
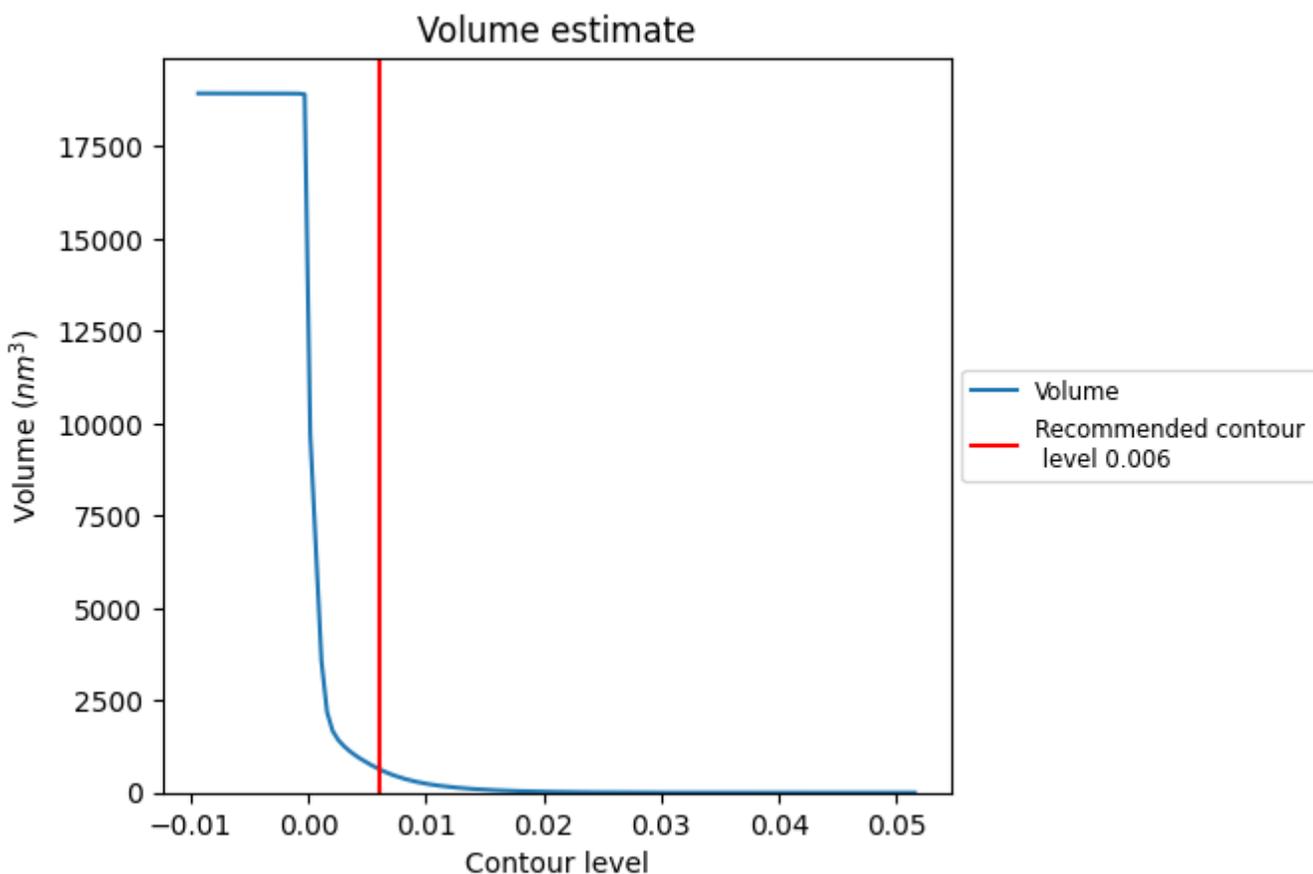
The volume at the recommended contour level is 642 nm^3; this corresponds to an approximate mass of 580 kDa.

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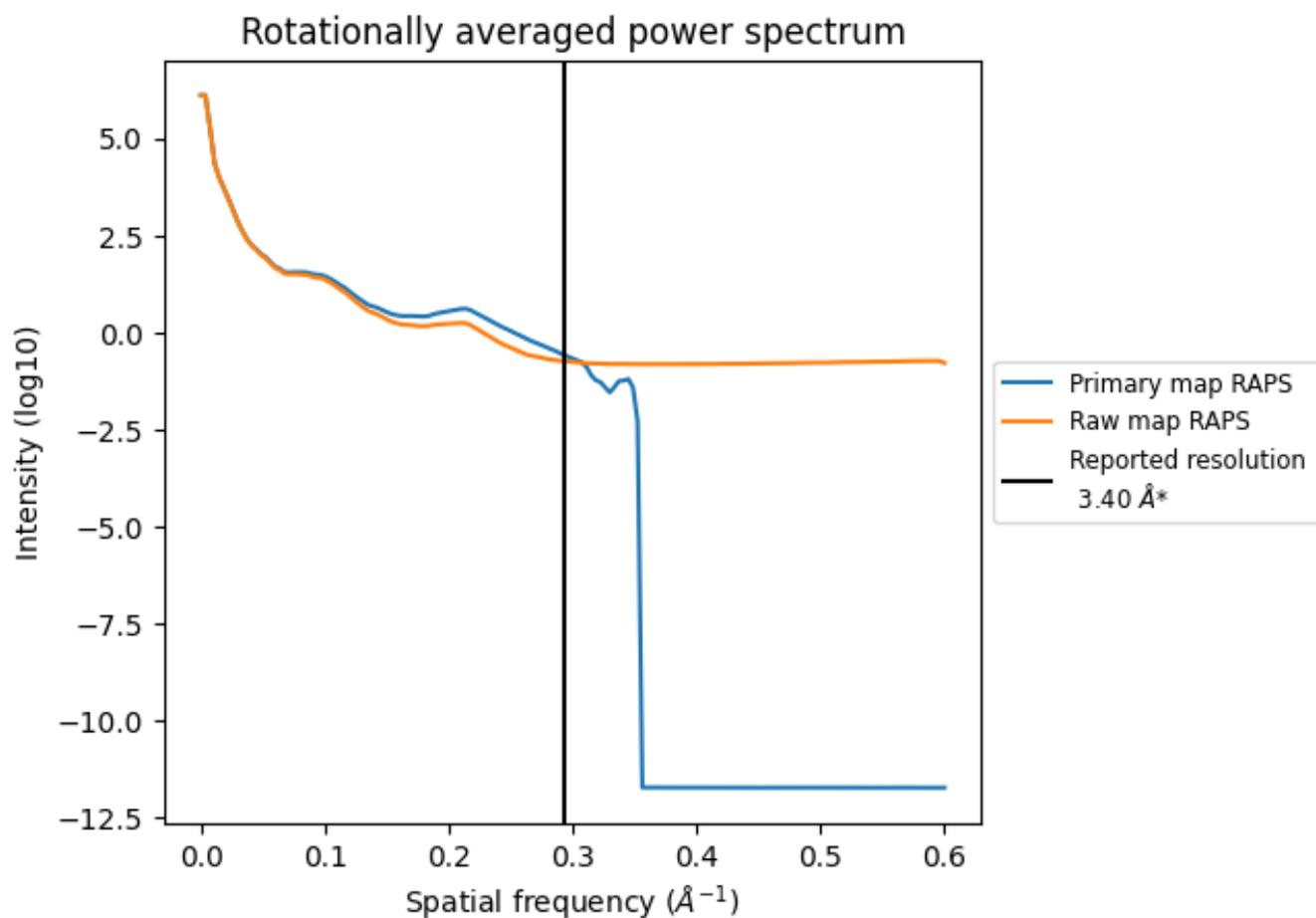
*Reported resolution corresponds to spatial frequency of 0.294 Å^{-1}

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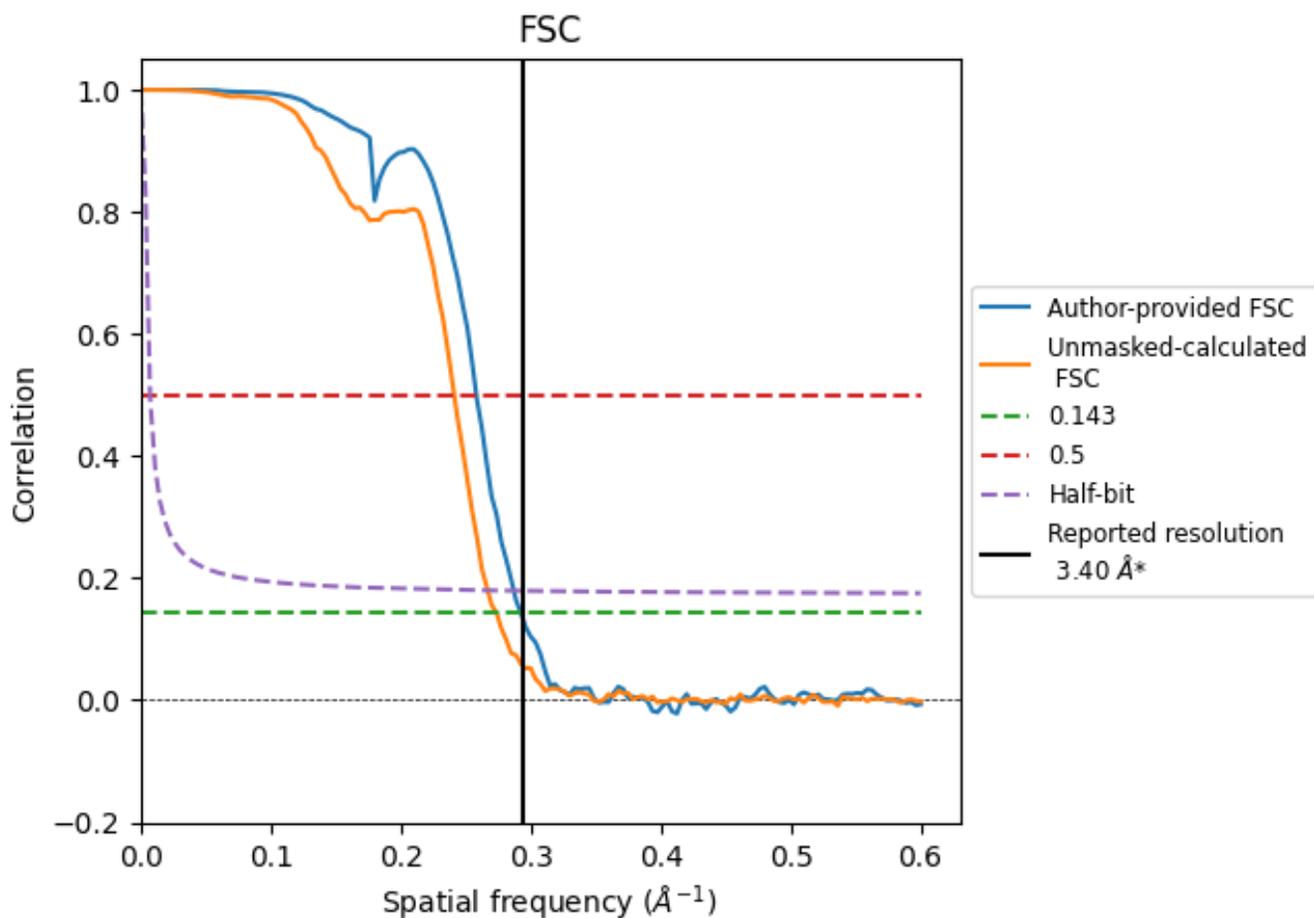
*Reported resolution corresponds to spatial frequency of 0.294 Å^{-1}

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	3.42	3.87	3.48
Unmasked-calculated*	3.65	4.14	3.75

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

9   Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-71525 and PDB model 9PD4. Per-residue inclusion information can be found in section 3 on page 8.

9.1   Map-model overlay ⓘ

| X | Y | Z |
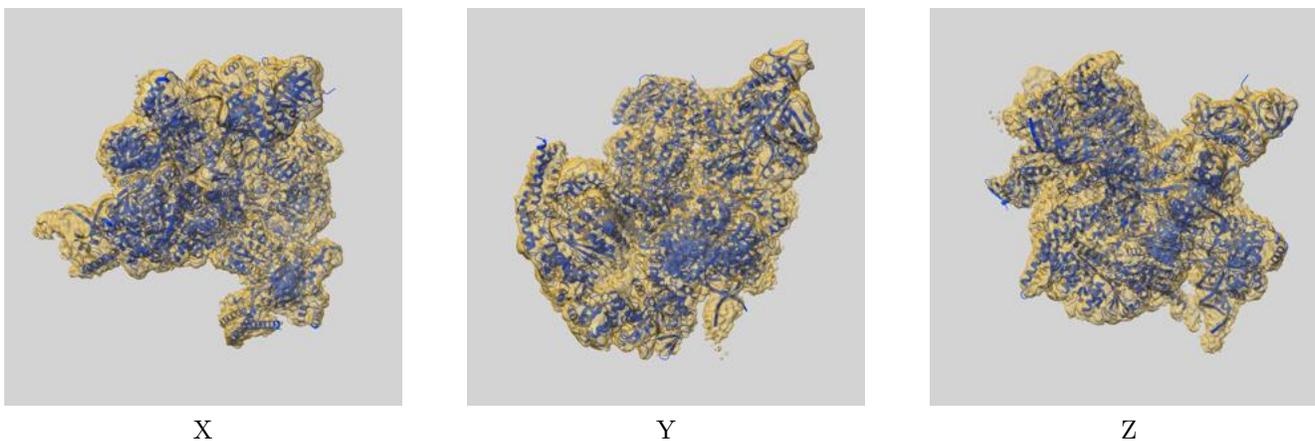
The images above show the 3D surface view of the map at the recommended contour level 0.006 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

## 9.2   Q-score mapped to coordinate model   ⓘ

X   Y   Z
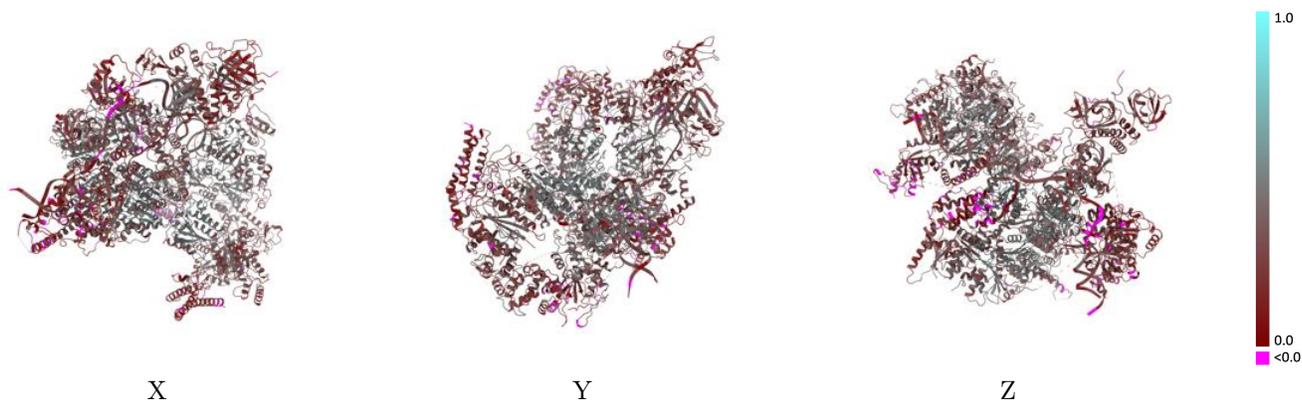
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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
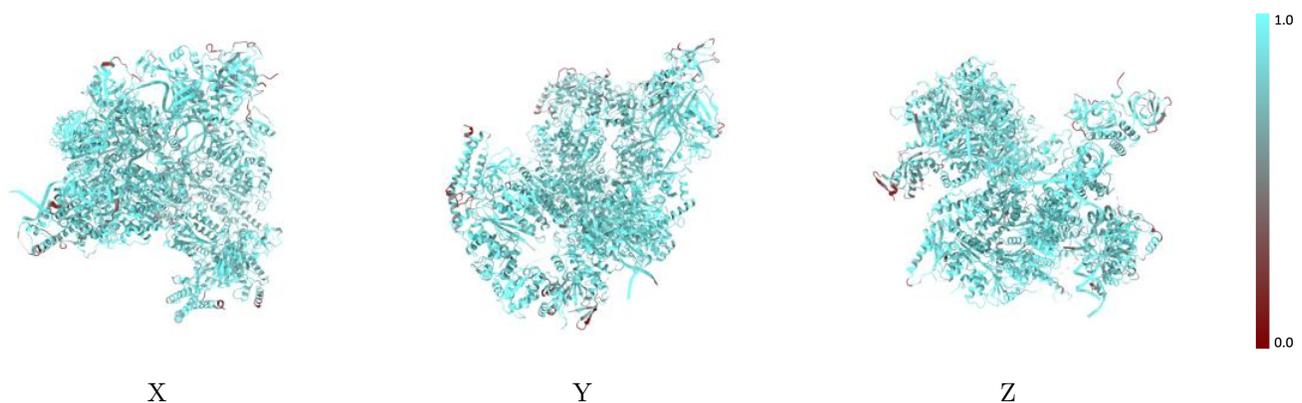
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.006).

9.4 Atom inclusion ⓘ
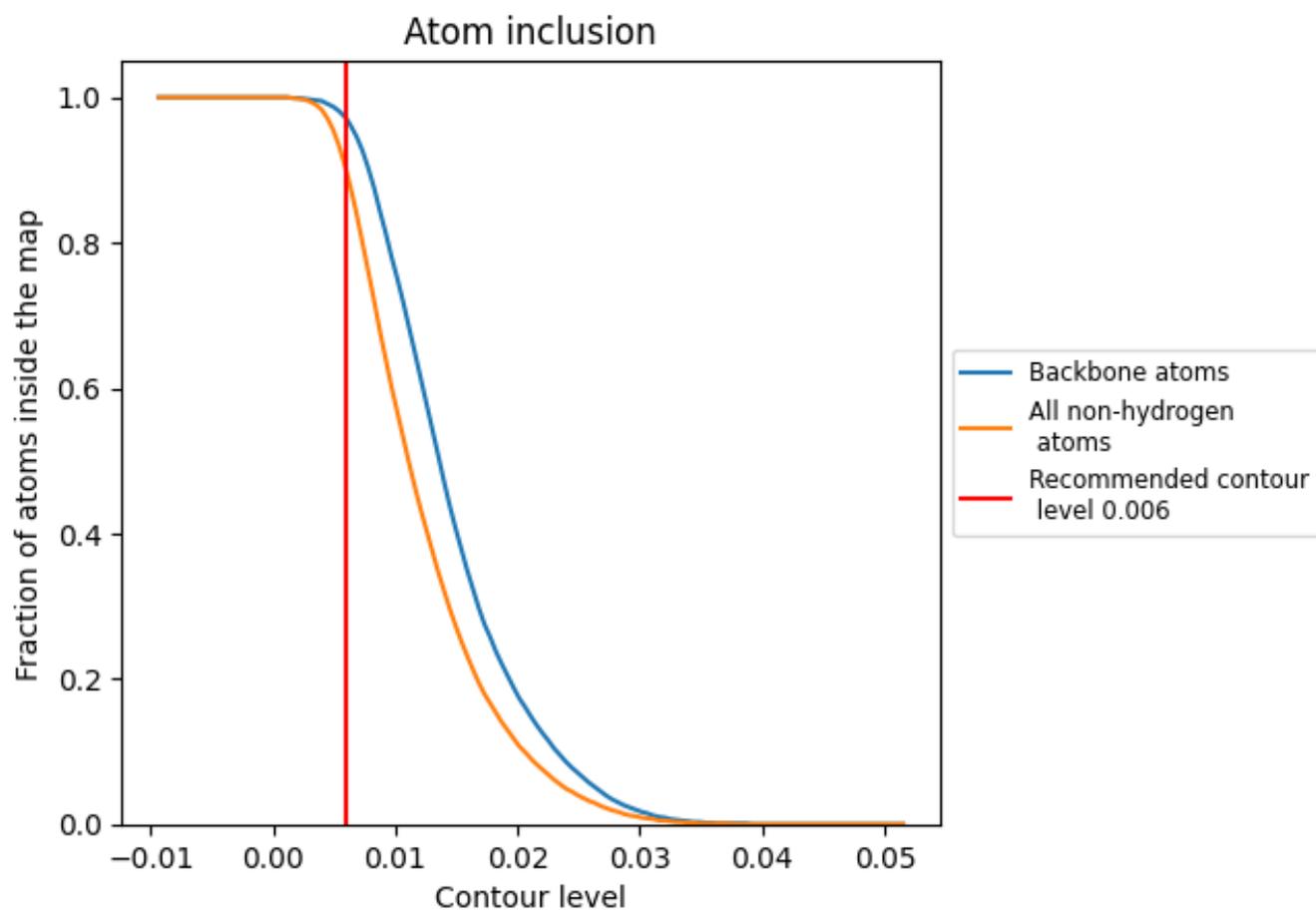
At the recommended contour level, 97% of all backbone atoms, 90% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.006) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8990	0.3220
A	0.9130	0.3860
B	0.9590	0.4230
C	0.8030	0.1800
D	0.8700	0.2890
E	0.8960	0.3550
F	0.9120	0.3060
G	0.8670	0.3000
K	0.8420	0.2670
L	0.9480	0.2710
M	0.9220	0.2650
N	0.9020	0.2630
O	0.8470	0.2980
P	0.7410	0.2240
Q	0.9450	0.3420
R	0.9710	0.4420
S	0.8320	0.2270

1.0

0.0
<0.0