WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB EM Validation Report ⓘ

Jun 25, 2025 – 08:14 am BST

PDB ID	:	8QPK / pdb_00008qpk
EMDB ID	:	EMD-18555
Title	:	Cryo-EM Structure of Pre-B+5'ss Complex (core part)
Authors	:	Zhang, Z.; Kumar, V.; Dybkov, O.; Will, C.L.; Zhong, J.; Ludwig, S.; Urlaub, H.; Kastner, B.; Stark, H.; Luehrmann, R.
Deposited on	:	2023-10-02
Resolution	:	4.20 Å(reported)

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

EMDB validation analysis	:	0.0.1.dev118
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0rc1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.44

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 4.20 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	Percentile Ranks	Value
Clashscore		9
Ramachandran outliers		0.0%
Sidechain outliers		0.1%
RNA backbone		0.47

Worse   *Better*

▌ Percentile relative to all structures

▯ Percentile relative to all EM structures
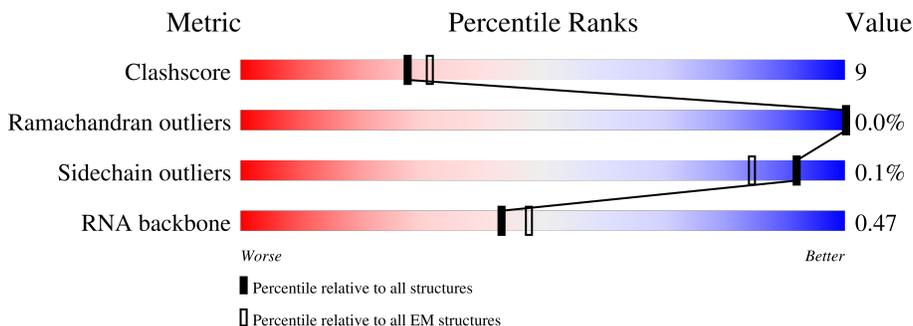
Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415
RNA backbone	6643	2191

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	G	820	11% · 88%
2	D	142	79% 20% ·
3	L	499	9% · 90%
4	A	2335	5% 68% 15% 17%
5	R	480	20% · 78%
6	U	565	74% 7% 19%
7	S	800	8% · 91%

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Mol	Chain	Length	Quality of chain
8	C	972	76% 10% 14%
9	5	117	26% 27% 13% 34%
10	4	144	8% 22% 28% · 47%
11	X	155	· 14% 86%
12	z	11	36% 55% 9%
13	6	106	8% 28% 9% · 59%
14	N	941	13% · 86%
15	B	2136	· 97%
16	7	793	· 95%

2 Entity composition ⓘ

There are 17 unique types of molecules in this entry. The entry contains 29527 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 Probable ATP-dependent RNA helicase DDX23.

Mol	Chain	Residues	Atoms				AltConf	Trace
1	G	102	Total 658	C 419	N 128	O 111	0	0

- Molecule 2 is a protein called Thioredoxin-like protein 4A.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	D	141	Total 1008	C 648	N 184	O 171	S 5	0	0

- Molecule 3 is a protein called U4/U6 small nuclear ribonucleoprotein Prp31.

Mol	Chain	Residues	Atoms				AltConf	Trace
3	L	50	Total 251	C 151	N 50	O 50	0	0

- Molecule 4 is a protein called Pre-mRNA-processing-splicing factor 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	A	1947	Total 13055	C 8360	N 2412	O 2254	S 29	0	0

- Molecule 5 is a protein called RNA-binding protein 42.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	R	106	Total 659	C 412	N 124	O 121	S 2	0	0

- Molecule 6 is a protein called Ubiquitin carboxyl-terminal hydrolase 39.

Mol	Chain	Residues	Atoms				AltConf	Trace
6	U	456	Total 2320	C 1404	N 459	O 457	0	0

- Molecule 7 is a protein called U4/U6.U5 tri-snRNP-associated protein 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	S	73	Total	C	N	O	S	0	0
			446	274	90	81	1		

- Molecule 8 is a protein called 116 kDa U5 small nuclear ribonucleoprotein component.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	C	836	Total	C	N	O	S	0	0
			5163	3262	981	913	7		

- Molecule 9 is a RNA chain called U5 snRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	5	77	Total	C	N	O	P	0	0
			1620	726	271	546	77		

- Molecule 10 is a RNA chain called U4 snRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	4	76	Total	C	N	O	P	0	0
			1617	723	286	532	76		

- Molecule 11 is a protein called U4/U6.U5 small nuclear ribonucleoprotein 27 kDa protein.

Mol	Chain	Residues	Atoms				AltConf	Trace
11	X	22	Total	C	N	O	0	0
			124	78	22	24		

- Molecule 12 is a RNA chain called 5'ss oligo.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	z	11	Total	C	N	O	P	0	0
			239	107	46	75	11		

- Molecule 13 is a RNA chain called U6 snRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	6	43	Total	C	N	O	P	0	0
			927	414	175	295	43		

- Molecule 14 is a protein called Pre-mRNA-processing factor 6.

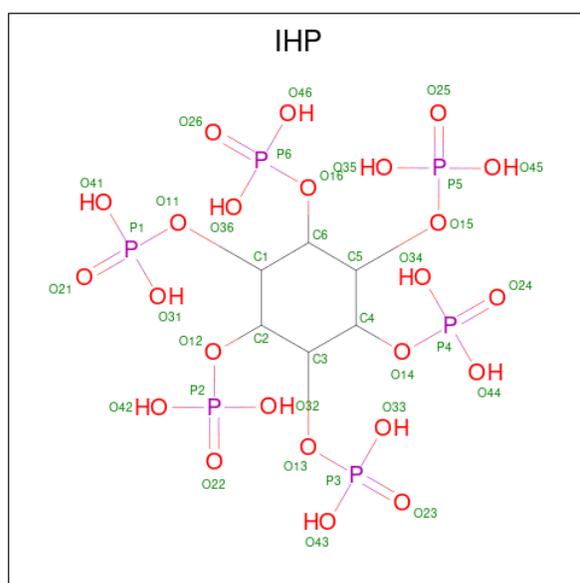| Mol	Chain	Residues	Atoms				AltConf	Trace
14	N	133	Total 784	C 482	N 157	O 145	0	0

- Molecule 15 is a protein called U5 small nuclear ribonucleoprotein 200 kDa helicase.

Mol	Chain	Residues	Atoms				AltConf	Trace
15	B	72	Total 401	C 238	N 86	O 77	0	0

- Molecule 16 is a protein called Splicing factor 3A subunit 1.

Mol	Chain	Residues	Atoms				AltConf	Trace
16	7	36	Total 219	C 136	N 43	O 40	0	0

- Molecule 17 is INOSITOL HEXAKISPHOSPHATE (CCD ID: IHP) (formula: $C_6H_{18}O_{24}P_6$) (labeled as "Ligand of Interest" by depositor).

IHP

Mol	Chain	Residues	Atoms				AltConf
17	A	1	Total 36	C 6	O 24	P 6	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: Probable ATP-dependent RNA helicase DDX23

Chain G:

• Molecule 2: Thioredoxin-like protein 4A

Chain D:

79%   20%

MET S2 L5 W12 Q13 V14 V25 R29 F30 G31 H32 D33 W34 Y46 N54 Y59 I63 N70 L75 F84 I90 M91 I92 D108 K109 Q110 I115 I116 V119 Y120 R121 K125 G126 R127 G128 L129 R141 Y142

• Molecule 3: U4/U6 small nuclear ribonucleoprotein Prp31

Chain L:

9%   90%

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

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

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

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

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

LEU ALA ALA ARG VAL ASP SER SER PHE HIS GLU SER GLU THR GLU GLY LYS VAL GLY TYR GLU LEU LYS ASP GLU ILE ARG LYS ASP PRO GLN GLY PRO PRO VAL LYS VAL K341 P342 L343 D348 G349 Q350 G355 G356 R357 R360 K361 G367 L368 T369 E370 I371

R372 K373 Q374 M378 E384 E385 Y388 Q389 E390 ASP LEU GLY PHE SER LEU GLY HIS LEU GLY LYS SER GLY GLY ARG VAL ARG GLN THR GLN VAL ASN GLU ALA GLN LYS LYS TYR PHE SER MET ALA GLU GLU PHE LEU LYS VAL LYS GLY GLU LYS GLY VAL TYR VAL VAL GLY GLY LYS

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

THR

• Molecule 4: Pre-mRNA-processing-splicing factor 8

Chain A:

5%   68%   15%   17%

MET ALA GLY VAL PHE PRO TYR ARG GLY PRO GLY ASN PRO VAL PRO GLY PRO LEU ALA PRO LEU PRO ASP TYR MET SER GLU GLU LYS LEU GLN GLU GLY LYS ALA ARG LYS TRP GLN GLN LEU GLN ALA LYS ARG TYR ALA GLU LYS ARG LYS PHE GLY PHE VAL ASP A56 H65 V66

I70 D75 M76 T77 K80 D84 K85 R86 V87 Y88 L89 G90 P96 L103 P109 L119 Y120 S127 F128 V129 N130 P133 I136 E137 P138 V139 S142 Q143 W144 G145 S146 M147 M150 M151 R152 R153 E154 K155 R156 D157 R158 F169 D170 D171 E172 E173 P174

P175 L176 D177 Y178 N181 I182 L183 L188 I191 E199 V203 F207 P212 L213 R214 D215 S216 R217 K218 Y219 S223 F230 M235 Y239 R240 L241 A242 N243 Q244 L245 Y254 L260 N270 R284 D285 I286 N287 L288 Q289 D290 E291 D298 I299 N300

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

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

SER HIS PHE LEU ASN PHE LEU LEU GLU GLY VAL GLU GLY VAL TYR SER ALA ASP GLU ASP TYR LEU TYR ALA

• Molecule 5: RNA-binding protein 42

Chain R:

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

PRO ALA VAL PRO VAL THR VAL PRO THR VAL PRO THR VAL PRO GLY ALA MET GLN VAL PRO ALA ALA PRO VAL ILE ARG ILE ILE ALA ASN THR TYR GLN GLN VAL GLN GLN THR LEU GLU ALA ARG ALA ALA ALA THR VAL VAL PRO MET VAL GLY GLY PRO PHE VAL

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

ARG PRO MET ALA LEU ARG ARG PRO HIS GLN ALA LEU LEU VAL GLY PRO LEU PRO GLY PRO GLY PRO MET MET PRO MET ARG ALA PRO GLY PRO LEU GLY SER MET ALA LEU PRO ARG PRO LEU GLU GLU ALA ALA ARG GLU LEU GLY LEU GLY

LEU GLY LEU GLY LYS GLU GLY LYS GLU ALA VAL VAL ALA ALA ALA GLY LEU GLU GLU ALA VAL ALA ALA GLY ALA GLY PRO ALA GLY PRO ALA VAL ILE GLY PRO SER LEU PRO LEU ALA LEU ALA MET PRO LEU PRO GLU LEU PRO GLU LEU PRO LEU

PRO LEU GLU GLY VAL ARG GLY LEU LEU PRO PRO LEU ARG ILE PRO GLU LEU LEU SER LEU ARG ALA PRO ARG ALA PRO ARG PRO GLU PRO PRO GLY LEU MET ALA LEU GLU GLU VAL PRO GLU GLY PRO LEU GLY LEU GLY ASP LYS LYS LYS GLY LYS PRO GLU LYS LEU LYS LEU ARG CYS ILE

ARG THR ALA ALA GLY SER SER TRP E369 C385 G386 D387 L388 K409 R414 T421 K422 G423 A438 E441 I452 D465 Q471 K472 E473 K474 LYS LYS LEU LEU ARG

• Molecule 6: Ubiquitin carboxyl-terminal hydrolase 39

Chain U:

MET SER GLY SER ARG SER LYS ARG GLU GLU SER ARG GLY SER THR ARG GLY LYS ARG SER GLU SER GLY ARG SER GLY ARG SER GLY VAL LYS ARG GLU GLU ASP ARG GLU ARG GLU ARG GLU GLU ALA ALA SER ARG SER ARG SER PRO VAL ARG VAL LYS ARG GLU GLU PRO ALA SER ALA ARG

GLU ALA PRO ALA SER VAL VAL PRO PHE VAL ARG VAL LYS ARG GLU GLU VAL ASP GLU SER GLU PRO GLY GLU ARG GLU VAL ARG ALA LYS ASN GLY ARG VAL ASP SER GLU ASP R100 Y107 I111 S125 A133 Y134 A135 Y142 F143 Q144 G145 R146 S150 H151 A152

F164 L165 N166 K171 F172 Y173 E180 D183 T198 I202 D206 P266 G267 D268 A292 M353 R354 T357 P366 A367 E368 E369 K370 E371 Q372 H375 T382 P399 D403 E406 Q407 L408 I409 I410 P411 F416 A420 G424 I425 T426

E429 L438 K439 R440 F441 Q442 L443 K459 V464 V504 S510 L529 L532 L544 Y548 R555 ASP ASN ASP GLU THR ASN GLN GLN GLY ALA

• Molecule 7: U4/U6.U5 tri-snRNP-associated protein 1

Chain S:

• Molecule 8: 116 kDa U5 small nuclear ribonucleoprotein component

Chain C:

76%   10%   14%

N743 I744 F770 Q771 W772 R775 R785 N786 F789 P800 R803 Q807 Q837 R813 R814 V815 F833 Q837 T848 A851 S866 E884 R888 Q892 F896 H902 L929 E932 F933 M934 I935 K936 K951 PHE ASP ASP PRO MET LEU

LEU GLU LEU ALA LYS GLN ASP VAL VAL LEU ASN TYR PRO MET

• Molecule 9: U5 snRNA

Chain 5:   26%   27%   13%   34%

A U A3 C4 G8 G9 U10 U11 U12 C13 U14 C15 U16 U17 C18 A19 G20 A21 U22 C23 G24 C25 A26 U27 A28 C36 G37 C38 C39 U40 U41 U42 U43 A44 C45 U46 A47 U52 U53 U54 C55 C56 G57 A61 G62 A63 G64 C68 A69 A70 U71 U72 C73 U74 G75

A76 G77 U78 C79 U U A A C C C A A U U U U U G A G G C C U U G C U U G G G A A G G C U A

• Molecule 10: U4 snRNA

8%

Chain 4:   22%   28%   •   47%

A1 G2 C3 U4 U5 U6 G7 C8 G9 G15 C16 A17 G18 U19 A20 U21 C22 G23 U24 A25 C26 C27 C28 A29 A30 U31 G32 A33 G34 G35 U36 C37 U38 A39 U40 C41 C42 G43 A44 G45 G46 A51 U52 U A U55 U56 G57 G64 A65 A66 A67 A68 C69 U70 U U

U73 C74 C75 C76 A77 A78 U79 A80 C C C C G C C G U U G A C G A C U U U U G C A A U A U A U A G U C C G G G C A A C U G G G G C A A U U U U U G A C A C A G U U C U

C U A C G G A G A C U U G

• Molecule 11: U4/U6.U5 small nuclear ribonucleoprotein 27 kDa protein

•

Chain X: 14%   86%

MET GLY ARG SER ARG SER ARG SER PRO ARG ARG GLU ARG ARG ARG SER ARG SER THR SER GLU ARG GLU ARG ARG GLU ARG SER ARG SER ARG GLU ARG ASP ARG ARG SER ARG SER ARG PRO HIS ARG ARG ARG SER ARG SER PRO ARG ARG HIS ARG SER THR

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

ASP GLY SER VAL ASN ALA TYR ALA ILE N130 V131 S132 Q133 K134 P150 L151 ASP PHE ILE ALA

• Molecule 12: 5'ss oligo

Chain z: 36%   55%   9%

A-3 A-2 G-1 U2 A3 A4 A7 U8

• Molecule 13: U6 snRNA

8%

Chain 6:   28%   9%   •   59%

G U G U G U C G C U U C G G C C A G C A C A C A U A C U A A A U31 U32 G33 G34 A35 A36 C G A U40 G44 A45 A46 A47 A48 G49 U52 A53 G54 C55 G59 C68 A69 A70 G71 G72

A73 U74 G75 A76 C A C G C A A A U U C G U G A A G C G G U U C C A U A U U U U

• Molecule 14: Pre-mRNA-processing factor 6

Chain N: 13%   •   86%

MET ASN LYS LYS LYS PRO F8 A13 P14 R23 R31 P36 A37 ARG ASP ALA ASN ASP PRO VAL ASP ASP ARG HIS ALA PRO PRO GLY LYS ARG THR VAL GLY ASP GLN MET LYS LYS ASN GLN ALA ALA ASP ASP ASP GLU ASP LEU ASN ASP THR ASN TYR ASP

GLU PHE ASN GLY TYR ALA GLY SER LEU PHE SER SER GLY PRO TYR GLU K96 Y105 R111 R116 R123 K137 D144 L145 G164 ASP ALA ARG ASN LYS ARG GLN ARG ASN PRO ARG TYR GLU LYS LEU THR PRO VAL PRO ASP SER PHE PHE ALA LYS HIS LEU GLN

THR GLY GLU ASN HIS THR SER VAL ASP PRO ARG GLN GLN THR GLN PHE GLY GLY LEU ASN THR PRO TYR PRO GLY LEU ASN THR PRO TYR PRO GLY GLY MET THR PRO GLY LEU MET THR PRO GLY THR G236 E237 L238 D239 D269 PRO LYS GLY TYR LEU THR ASP LEU ASN SER MET

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

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

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

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

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

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

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

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

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

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

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

PHE

• Molecule 15: U5 small nuclear ribonucleoprotein 200 kDa helicase

Chain B: 97%

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ASP

• **Molecule 16: Splicing factor 3A subunit 1**

Chain 7:   ·   95%

E454 V455 R473 I476 F477 G478 I484 G489

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	176879	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 $(e^-/\text{Å}^2)$	45	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	5000	Depositor
Magnification	Not provided	
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	0.096	Depositor
Minimum map value	-0.044	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.002	Depositor
Recommended contour level	0.0165	Depositor
Map size (Å)	580.0, 580.0, 580.0	wwPDB
Map dimensions	500, 500, 500	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.16, 1.16, 1.16	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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

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	G	0.09	0/667	0.26	0/906
2	D	0.10	0/1032	0.27	0/1409
3	L	0.06	0/253	0.20	0/352
4	A	0.13	0/13400	0.30	1/18475 (0.0%)
5	R	0.08	0/668	0.25	0/913
6	U	0.09	0/2343	0.25	0/3285
7	S	0.08	0/450	0.21	0/610
8	C	0.09	0/5286	0.27	0/7297
9	5	0.08	0/1806	0.18	0/2807
10	4	0.05	0/1805	0.13	0/2805
11	X	0.06	0/126	0.20	0/174
12	z	0.07	0/268	0.17	0/416
13	6	0.05	0/1038	0.10	0/1615
14	N	0.06	0/794	0.19	0/1086
15	B	0.08	0/401	0.25	0/544
16	7	0.06	0/220	0.17	0/300
All	All	0.10	0/30557	0.26	1/42994 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	A	85	LYS	CB-CA-C	-5.91	109.75	116.54

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	G	658	0	505	11	0
2	D	1008	0	877	22	0
3	L	251	0	128	6	0
4	A	13055	0	10358	265	0
5	R	659	0	511	7	0
6	U	2320	0	1124	24	0
7	S	446	0	330	7	0
8	C	5163	0	3686	66	0
9	5	1620	0	822	29	0
10	4	1617	0	819	30	0
11	X	124	0	64	0	0
12	z	239	0	119	4	0
13	6	927	0	467	15	0
14	N	784	0	517	12	0
15	B	401	0	244	14	0
16	7	219	0	171	2	0
17	A	36	0	6	0	0
All	All	29527	0	20748	449	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 9.

All (449) 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)
6:U:164:PHE:H	6:U:173:TYR:H	1.29	0.81
4:A:1536:LEU:HD22	4:A:1572:SER:HB3	1.64	0.77
4:A:1571:ILE:HD12	4:A:1574:ILE:HD11	1.70	0.73
4:A:136:ILE:HG13	4:A:418:THR:HG22	1.69	0.73
4:A:596:TYR:HE1	9:5:46:U:H5'	1.54	0.73
4:A:545:HIS:CE1	4:A:593:ARG:HE	2.07	0.72
5:R:387:ASP:H	10:4:68:A:H61	1.38	0.71
8:C:478:THR:HA	8:C:494:GLY:HA3	1.73	0.70
7:S:731:HIS:HE1	10:4:66:A:H5'	1.56	0.70
1:G:301:ARG:HD3	4:A:341:LYS:HB3	1.72	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:443:VAL:N	4:A:610:HIS:HE1	1.90	0.69
4:A:604:MET:SD	4:A:636:VAL:HG11	2.32	0.69
5:R:385:CYS:HB3	5:R:452:ILE:HD11	1.74	0.68
4:A:545:HIS:HE1	4:A:593:ARG:HE	1.41	0.68
4:A:601:GLN:HB2	4:A:640:PHE:CE2	2.29	0.68
8:C:350:ASN:O	8:C:354:ARG:N	2.27	0.68
4:A:1706:ASP:O	4:A:1710:ASN:N	2.26	0.68
4:A:154:GLU:OE2	4:A:158:ARG:NH2	2.27	0.68
9:5:19:A:N3	9:5:21:A:N6	2.42	0.67
2:D:70:ASN:HA	2:D:75:LEU:HB2	1.76	0.67
12:z:3:A:N6	13:6:44:G:O2'	2.28	0.66
4:A:1185:LEU:HB2	4:A:1196:ILE:HG22	1.78	0.66
4:A:84:ASP:HB3	4:A:88:TYR:HB2	1.78	0.66
4:A:305:ARG:HH22	8:C:929:LEU:HD22	1.60	0.66
8:C:208:HIS:HB3	8:C:211:PHE:HB2	1.76	0.66
9:5:16:U:OP1	14:N:111:ARG:NH1	2.30	0.65
4:A:155:LYS:HG2	4:A:622:GLY:H	1.61	0.65
4:A:89:LEU:HD21	4:A:656:LEU:HA	1.79	0.65
4:A:825:ILE:HD12	4:A:929:GLU:HB3	1.79	0.65
4:A:425:PRO:HB2	4:A:428:LYS:HB2	1.77	0.64
4:A:75:ASP:HA	4:A:498:ARG:HH21	1.62	0.64
9:5:23:C:O2'	9:5:57:G:N2	2.27	0.64
4:A:1614:ILE:HD11	4:A:1628:ASP:HA	1.78	0.64
7:S:713:VAL:HG13	7:S:717:GLY:HA2	1.78	0.64
4:A:199:GLU:OE1	4:A:240:ARG:NH1	2.30	0.63
5:R:438:ALA:HA	5:R:441:GLU:HB3	1.80	0.63
4:A:596:TYR:CE1	9:5:46:U:H5'	2.34	0.63
8:C:679:PRO:HD2	8:C:807:GLN:HB3	1.81	0.63
6:U:504:VAL:HA	6:U:548:TYR:H	1.64	0.62
4:A:136:ILE:HG22	4:A:138:PRO:HD2	1.82	0.62
4:A:723:ASN:ND2	4:A:788:GLN:OE1	2.32	0.62
4:A:706:ALA:O	4:A:709:ILE:HB	2.00	0.62
4:A:1273:TYR:O	4:A:1375:TRP:NE1	2.31	0.62
4:A:825:ILE:HB	4:A:1001:VAL:HG23	1.82	0.61
4:A:1124:ASN:O	4:A:1151:ARG:NH1	2.33	0.61
4:A:70:ILE:HG12	4:A:495:GLN:HE22	1.65	0.61
8:C:314:TYR:HB3	8:C:417:ARG:HA	1.81	0.61
4:A:940:ILE:HG22	4:A:942:PRO:HD2	1.82	0.61
8:C:704:VAL:HG12	8:C:705:VAL:HG23	1.83	0.60
4:A:1084:PRO:HB3	4:A:1101:PHE:HE1	1.66	0.60
6:U:173:TYR:HA	6:U:180:GLU:HA	1.82	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:1486:GLU:O	4:A:1491:LYS:NZ	2.33	0.60
2:D:54:ASN:ND2	3:L:343:LEU:O	2.35	0.60
4:A:1415:GLY:HA3	4:A:1419:ILE:HD12	1.83	0.60
9:5:77:G:OP2	9:5:79:C:N4	2.33	0.60
8:C:592:VAL:HG22	8:C:641:MET:HE1	1.82	0.60
4:A:988:ILE:HD12	4:A:1044:TYR:HE2	1.67	0.59
4:A:1300:LYS:HD2	4:A:1308:PRO:HG2	1.84	0.59
4:A:1580:HIS:NE2	13:6:44:G:OP2	2.35	0.59
4:A:880:ARG:O	4:A:884:HIS:ND1	2.34	0.59
4:A:336:ASN:OD1	8:C:837:GLN:NE2	2.32	0.59
8:C:837:GLN:HE21	8:C:896:PHE:HB3	1.66	0.59
8:C:590:ILE:HD12	8:C:641:MET:HE2	1.85	0.59
4:A:1534:PHE:HA	4:A:1537:TRP:HB3	1.84	0.59
4:A:239:TYR:O	4:A:243:ASN:ND2	2.36	0.59
4:A:178:TYR:HA	4:A:182:ILE:HD13	1.85	0.58
4:A:710:LEU:O	4:A:713:LEU:HB2	2.02	0.58
4:A:1338:SER:HA	4:A:1341:ARG:HH21	1.68	0.58
9:5:21:A:H2'	9:5:23:C:H5"	1.85	0.58
4:A:539:ARG:HB3	14:N:31:ARG:HG3	1.84	0.58
4:A:103:LEU:O	4:A:634:TRP:NE1	2.32	0.58
2:D:90:ILE:HD13	2:D:119:VAL:HG13	1.86	0.58
4:A:710:LEU:HA	4:A:713:LEU:HD12	1.84	0.58
2:D:125:LYS:HG2	2:D:127:ARG:HH21	1.69	0.58
4:A:540:PHE:O	12:z:-3:A:O2'	2.21	0.58
4:A:219:TYR:HB3	4:A:230:PHE:HE1	1.69	0.57
4:A:564:TYR:CG	4:A:574:LEU:HD22	2.40	0.57
1:G:245:LYS:HA	1:G:248:HIS:CD2	2.40	0.57
4:A:909:TYR:HB2	4:A:1033:GLY:HA3	1.87	0.57
2:D:5:LEU:HD11	2:D:46:TYR:HB2	1.87	0.56
2:D:84:PHE:HE2	14:N:23:ARG:HD2	1.71	0.56
4:A:1260:VAL:O	4:A:1264:ASN:ND2	2.39	0.56
4:A:143:GLN:O	4:A:147:MET:HG2	2.06	0.56
4:A:1491:LYS:HG3	4:A:1709:TYR:HA	1.88	0.56
4:A:1382:SER:HA	4:A:1415:GLY:HA2	1.88	0.56
4:A:1531:ASN:HA	4:A:1534:PHE:CE1	2.41	0.56
4:A:557:VAL:HG22	4:A:581:ILE:HD12	1.88	0.55
8:C:185:PRO:HA	8:C:203:MET:HA	1.86	0.55
9:5:36:C:H2'	9:5:37:G:H8	1.71	0.55
10:4:64:G:H22	10:4:67:A:H5'	1.71	0.55
4:A:811:THR:O	4:A:815:HIS:ND1	2.39	0.55
4:A:1466:ASN:ND2	15:B:57:GLN:O	2.40	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:599:MET:SD	4:A:603:ARG:HD2	2.46	0.55
4:A:1725:LEU:HA	7:S:706:PRO:HG3	1.89	0.55
9:5:74:U:H2'	9:5:75:G:C8	2.41	0.55
10:4:74:C:N4	13:6:34:G:O6	2.39	0.55
4:A:342:THR:HG21	4:A:399:ALA:HB1	1.89	0.55
8:C:211:PHE:HE1	8:C:636:TYR:HA	1.71	0.55
4:A:357:ASN:ND2	8:C:866:SER:O	2.40	0.55
10:4:78:A:N6	13:6:32:U:O4	2.38	0.55
4:A:212:PRO:HB2	4:A:213:LEU:HD12	1.87	0.55
4:A:1190:CYS:O	4:A:1273:TYR:OH	2.24	0.55
4:A:223:SER:OG	9:5:12:U:O5'	2.24	0.55
4:A:84:ASP:CG	4:A:88:TYR:HB2	2.32	0.54
4:A:156:ARG:HD2	4:A:620:PRO:HG2	1.89	0.54
4:A:966:TRP:O	4:A:1178:TYR:OH	2.22	0.54
4:A:441:VAL:HG13	4:A:444:ARG:HH21	1.71	0.54
1:G:245:LYS:HA	1:G:248:HIS:NE2	2.21	0.54
4:A:902:TYR:OH	4:A:1249:MET:SD	2.64	0.54
8:C:677:GLU:HA	8:C:684:LYS:HA	1.90	0.54
4:A:546:LEU:HD11	4:A:595:LYS:HB2	1.90	0.54
4:A:942:PRO:HD3	4:A:1091:TYR:HA	1.89	0.54
7:S:736:LYS:NZ	10:4:66:A:O2'	2.40	0.54
6:U:198:THR:O	6:U:202:ILE:N	2.39	0.54
3:L:355:GLY:O	13:6:55:C:N4	2.34	0.54
4:A:725:PRO:HB3	6:U:403:ASP:HA	1.90	0.54
4:A:1084:PRO:O	4:A:1086:ARG:NH1	2.41	0.54
4:A:1659:LYS:HB2	4:A:1697:SER:HB3	1.88	0.54
6:U:125:SER:N	6:U:142:TYR:O	2.41	0.54
4:A:318:TYR:O	8:C:645:ARG:NH1	2.41	0.53
4:A:605:CYS:O	4:A:608:LEU:HG	2.08	0.53
4:A:1566:ILE:HG21	4:A:1569:LEU:HD23	1.90	0.53
8:C:789:PHE:HZ	8:C:815:VAL:HG12	1.73	0.53
4:A:109:PRO:HB2	4:A:147:MET:HE3	1.91	0.53
4:A:1308:PRO:HG3	4:A:1548:TYR:CZ	2.44	0.53
4:A:302:ILE:O	8:C:936:LYS:NZ	2.42	0.52
4:A:689:VAL:HG21	4:A:742:TYR:CD1	2.44	0.52
8:C:703:GLU:O	8:C:706:GLN:NE2	2.42	0.52
1:G:276:TRP:HA	4:A:603:ARG:HH21	1.74	0.52
4:A:601:GLN:O	4:A:604:MET:HG3	2.10	0.52
7:S:721:THR:HG23	7:S:724:GLU:H	1.75	0.52
4:A:453:TYR:HE1	4:A:600:ARG:CD	2.23	0.52
4:A:600:ARG:O	4:A:603:ARG:HG2	2.10	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:465:LYS:C	9:5:23:C:H42	2.17	0.52
4:A:1502:PHE:O	4:A:1754:TYR:N	2.43	0.52
4:A:175:PRO:HG3	4:A:498:ARG:HD3	1.92	0.52
10:4:22:C:H2'	10:4:23:G:H8	1.76	0.52
4:A:457:ASN:ND2	9:5:28:A:OP2	2.43	0.51
4:A:1443:LYS:HA	4:A:1446:GLN:HB2	1.91	0.51
4:A:442:LYS:C	4:A:610:HIS:HE1	2.18	0.51
8:C:620:LYS:NZ	8:C:621:VAL:O	2.44	0.51
15:B:66:GLU:O	15:B:70:LYS:HG2	2.11	0.51
4:A:84:ASP:CB	4:A:88:TYR:HB2	2.40	0.51
8:C:735:PHE:HA	8:C:744:ILE:HA	1.92	0.51
4:A:1371:TYR:HE1	15:B:55:LYS:HB2	1.74	0.51
4:A:1465:TRP:H	4:A:1465:TRP:CD1	2.27	0.51
8:C:833:PHE:HB2	8:C:902:HIS:HB2	1.93	0.51
4:A:1590:VAL:HG23	4:A:1629:ILE:HD11	1.93	0.51
8:C:636:TYR:O	8:C:640:VAL:HG23	2.11	0.51
10:4:19:U:H4'	10:4:20:A:C8	2.45	0.51
4:A:215:ASP:O	4:A:217:ARG:NH1	2.44	0.51
4:A:443:VAL:N	4:A:610:HIS:CE1	2.77	0.51
6:U:429:GLU:HA	6:U:438:LEU:HA	1.93	0.51
4:A:260:LEU:HD21	4:A:454:TYR:HE2	1.75	0.51
4:A:291:GLU:O	4:A:1136:ARG:NE	2.39	0.51
4:A:443:VAL:HA	4:A:610:HIS:CE1	2.46	0.50
4:A:697:MET:HE2	4:A:706:ALA:HB2	1.92	0.50
4:A:752:ASN:HA	4:A:755:HIS:CD2	2.46	0.50
8:C:300:LEU:HA	8:C:306:ASN:HD22	1.76	0.50
2:D:125:LYS:HE2	2:D:125:LYS:HA	1.94	0.50
4:A:593:ARG:HG2	4:A:594:TYR:N	2.26	0.50
6:U:357:THR:N	6:U:382:THR:O	2.44	0.50
4:A:990:LEU:O	4:A:994:ASN:ND2	2.44	0.50
4:A:1487:HIS:HB3	4:A:1541:THR:HB	1.94	0.50
15:B:76:GLU:HA	15:B:79:HIS:HD1	1.76	0.50
4:A:1001:VAL:HG22	4:A:1002:ASP:H	1.77	0.50
8:C:932:GLU:HA	8:C:935:ILE:HG22	1.93	0.50
4:A:428:LYS:HA	4:A:431:TYR:CZ	2.46	0.50
4:A:443:VAL:HA	4:A:610:HIS:ND1	2.27	0.50
6:U:133:ALA:HA	6:U:144:GLN:HA	1.94	0.50
14:N:144:ASP:OD1	14:N:144:ASP:N	2.45	0.50
4:A:150:MET:HE3	4:A:191:ILE:HG22	1.94	0.49
4:A:152:ARG:NH2	4:A:619:GLY:H	2.10	0.49
4:A:546:LEU:HD21	4:A:595:LYS:HB2	1.94	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:223:SER:N	9:5:12:U:OP1	2.45	0.49
8:C:350:ASN:O	8:C:354:ARG:CA	2.61	0.49
4:A:65:HIS:CE1	4:A:66:VAL:HG23	2.48	0.49
4:A:597:LYS:HG3	9:5:45:C:OP1	2.13	0.49
8:C:181:ILE:HA	8:C:211:PHE:CE2	2.47	0.49
8:C:474:LEU:HA	8:C:499:GLY:HA3	1.95	0.49
10:4:33:A:N3	10:4:45:G:O2'	2.46	0.49
4:A:442:LYS:C	4:A:610:HIS:CE1	2.91	0.49
10:4:6:U:H2'	10:4:7:G:C8	2.48	0.49
4:A:1045:GLY:HA2	4:A:1048:MET:HE2	1.95	0.49
4:A:1645:LEU:HA	4:A:1723:LYS:HE3	1.94	0.49
8:C:139:HIS:NE2	8:C:143:THR:OG1	2.45	0.49
4:A:997:LEU:HA	4:A:1000:ILE:HG22	1.95	0.48
2:D:12:TRP:HB3	14:N:13:ALA:HB1	1.96	0.48
4:A:155:LYS:HG2	4:A:622:GLY:N	2.28	0.48
5:R:414:ARG:HA	5:R:421:THR:HA	1.96	0.48
4:A:169:PHE:HB2	4:A:173:GLU:HG2	1.96	0.48
4:A:84:ASP:OD1	4:A:87:VAL:HB	2.13	0.48
4:A:145:GLY:HA2	4:A:245:LEU:HG	1.95	0.48
6:U:135:ALA:HA	6:U:142:TYR:HA	1.94	0.48
6:U:353:MET:HA	6:U:443:LEU:HA	1.96	0.48
10:4:17:A:N3	13:6:59:G:N2	2.62	0.48
1:G:278:ALA:HA	4:A:445:VAL:HG21	1.96	0.48
4:A:254:TYR:HE1	8:C:892:GLN:HE21	1.62	0.48
4:A:544:PHE:N	4:A:651:TRP:HZ3	2.11	0.48
4:A:1335:ILE:N	4:A:1363:GLN:O	2.45	0.48
2:D:29:ARG:HH12	2:D:31:GLY:HA3	1.77	0.48
4:A:158:ARG:HH12	4:A:573:GLN:HE22	1.62	0.48
8:C:139:HIS:HB2	8:C:207:GLY:H	1.78	0.48
2:D:34:TRP:H	2:D:34:TRP:CD1	2.32	0.48
4:A:510:ARG:NH1	4:A:655:LEU:HD12	2.29	0.48
4:A:1537:TRP:HE3	4:A:1751:LEU:HD23	1.78	0.48
2:D:30:PHE:HB3	2:D:63:ILE:HD11	1.96	0.47
9:5:8:G:H21	9:5:71:C:H5	1.61	0.47
10:4:7:G:H2'	10:4:8:C:C6	2.49	0.47
5:R:387:ASP:N	10:4:68:A:H61	2.06	0.47
8:C:189:VAL:HA	8:C:199:LEU:HA	1.97	0.47
10:4:8:C:N4	10:4:9:G:O6	2.47	0.47
10:4:43:G:H4'	10:4:44:A:H5'	1.96	0.47
4:A:331:TRP:NE1	4:A:333:HIS:O	2.42	0.47
1:G:272:PHE:CD1	4:A:592:TYR:HB3	2.50	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:396:ASP:OD1	4:A:396:ASP:N	2.45	0.47
4:A:599:MET:O	4:A:602:ILE:HG12	2.15	0.47
8:C:500:THR:HG22	8:C:545:PRO:HA	1.96	0.47
4:A:780:THR:HG22	4:A:898:PHE:HD2	1.80	0.47
13:6:34:G:H2'	13:6:35:A:C8	2.49	0.47
4:A:601:GLN:HG3	4:A:640:PHE:CG	2.50	0.47
4:A:1195:ARG:HH22	4:A:1197:LEU:HD22	1.80	0.47
4:A:1544:ARG:O	4:A:1563:HIS:ND1	2.48	0.47
4:A:1642:PRO:HB3	4:A:1716:GLY:HA2	1.96	0.47
4:A:136:ILE:HB	4:A:139:VAL:HG12	1.96	0.47
4:A:584:HIS:O	4:A:588:LEU:HD13	2.15	0.47
9:5:24:G:O6	9:5:56:C:N4	2.46	0.47
4:A:230:PHE:HD2	4:A:235:MET:HE1	1.80	0.47
4:A:735:ILE:O	4:A:739:ILE:HG12	2.15	0.47
4:A:96:PRO:HB2	4:A:645:THR:HG22	1.97	0.47
8:C:718:PHE:HB3	8:C:724:TRP:HB2	1.96	0.47
9:5:71:C:H2'	9:5:72:U:H4'	1.97	0.47
4:A:90:GLY:HA3	14:N:105:TYR:CE2	2.50	0.46
3:L:356:GLY:O	3:L:360:ARG:N	2.41	0.46
4:A:109:PRO:HD3	4:A:630:TRP:HZ2	1.81	0.46
4:A:1285:LEU:HD22	15:B:43:LEU:HD13	1.96	0.46
8:C:614:TYR:HD2	8:C:640:VAL:HG22	1.81	0.46
10:4:67:A:H61	13:6:46:G:H1	1.63	0.46
10:4:76:C:H2'	10:4:77:A:C8	2.50	0.46
4:A:176:LEU:HD23	4:A:181:ASN:HD21	1.80	0.46
4:A:608:LEU:O	4:A:612:ILE:HG12	2.15	0.46
2:D:91:MET:HB2	2:D:129:LEU:HA	1.97	0.46
4:A:420:ARG:NH2	4:A:422:LEU:HD21	2.30	0.46
4:A:1092:ILE:HG13	4:A:1093:ASP:N	2.29	0.46
4:A:1156:ASP:OD2	4:A:1160:ARG:NH2	2.48	0.46
4:A:298:ASP:OD1	4:A:298:ASP:N	2.47	0.46
4:A:591:MET:O	4:A:592:TYR:C	2.58	0.46
4:A:1371:TYR:CE1	15:B:55:LYS:HB2	2.50	0.46
13:6:47:A:H4'	13:6:48:A:H3'	1.97	0.46
4:A:137:GLU:OE2	4:A:419:ARG:NH1	2.48	0.46
4:A:300:ASN:C	4:A:301:LYS:HE2	2.41	0.46
4:A:332:TYR:O	8:C:888:ARG:NH1	2.33	0.46
6:U:399:PRO:HD3	6:U:411:PRO:HG3	1.98	0.46
4:A:909:TYR:HD2	4:A:1033:GLY:H	1.63	0.46
4:A:1185:LEU:HB2	4:A:1196:ILE:CG2	2.43	0.46
8:C:531:TRP:HA	8:C:539:ILE:HA	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:792:HIS:O	4:A:796:LYS:HG2	2.16	0.45
8:C:448:LYS:HB2	8:C:448:LYS:HE2	1.70	0.45
8:C:614:TYR:CD2	8:C:640:VAL:HG22	2.50	0.45
4:A:305:ARG:HH21	8:C:933:PHE:HZ	1.64	0.45
4:A:501:TYR:HA	4:A:522:PHE:HE1	1.80	0.45
10:4:57:G:H1	13:6:55:C:H42	1.63	0.45
10:4:56:U:H2'	10:4:57:G:C8	2.52	0.45
2:D:141:ARG:HA	2:D:141:ARG:HD3	1.86	0.45
4:A:1571:ILE:O	4:A:1575:GLN:HG2	2.16	0.45
10:4:27:C:N3	10:4:28:C:N4	2.65	0.45
2:D:121:ARG:NH1	4:A:1522:GLN:OE1	2.32	0.45
4:A:348:PRO:HA	4:A:394:TYR:CZ	2.52	0.45
10:4:67:A:N1	13:6:46:G:N2	2.58	0.45
4:A:1650:ASP:O	7:S:699:LYS:N	2.49	0.45
2:D:92:ILE:HD13	2:D:119:VAL:HG22	1.98	0.45
2:D:115:ILE:O	2:D:119:VAL:HG23	2.17	0.45
5:R:388:LEU:HB2	5:R:423:GLY:HA2	1.99	0.45
6:U:399:PRO:HG3	6:U:411:PRO:HD3	1.99	0.45
8:C:231:ALA:N	8:C:258:ASN:O	2.45	0.45
1:G:272:PHE:CE1	4:A:592:TYR:HB3	2.52	0.45
4:A:219:TYR:HB3	4:A:230:PHE:CE1	2.50	0.45
4:A:750:TRP:HH2	4:A:781:ARG:HB3	1.80	0.45
10:4:32:G:N2	10:4:43:G:O2'	2.49	0.45
4:A:470:ARG:NH2	9:5:16:U:OP2	2.50	0.45
9:5:37:G:H2'	9:5:38:C:H4'	1.99	0.45
4:A:791:GLN:HE22	4:A:1028:TYR:H	1.66	0.45
6:U:166:ASN:H	6:U:171:LYS:N	2.15	0.45
4:A:553:LEU:O	4:A:556:LEU:HG	2.18	0.44
4:A:968:THR:O	4:A:972:GLU:N	2.49	0.44
4:A:1106:ALA:HB1	4:A:1149:LEU:HD11	1.99	0.44
15:B:76:GLU:HA	15:B:79:HIS:ND1	2.31	0.44
2:D:32:HIS:HB3	2:D:34:TRP:NE1	2.32	0.44
4:A:152:ARG:HH21	4:A:619:GLY:H	1.65	0.44
4:A:1637:TRP:CZ2	4:A:1720:PRO:HD2	2.52	0.44
4:A:1681:ARG:HG3	4:A:1715:TYR:CZ	2.53	0.44
6:U:416:PHE:O	6:U:420:ALA:N	2.50	0.44
4:A:443:VAL:CA	4:A:610:HIS:CE1	3.01	0.44
4:A:316:PHE:HD2	4:A:320:TYR:HE2	1.65	0.44
4:A:1180:LYS:O	4:A:1201:ARG:NH2	2.50	0.44
6:U:354:ARG:N	6:U:442:GLN:O	2.50	0.44
8:C:459:SER:O	8:C:463:GLU:N	2.41	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:344:ASP:OD1	4:A:344:ASP:N	2.47	0.44
4:A:1587:GLU:HA	4:A:1590:VAL:HG12	2.00	0.44
6:U:426:THR:HA	6:U:440:ARG:HA	2.00	0.44
4:A:144:TRP:HZ3	4:A:629:PHE:HA	1.83	0.44
6:U:459:LYS:HA	6:U:464:VAL:HA	1.99	0.44
9:5:26:A:H2'	9:5:27:U:O4'	2.18	0.44
14:N:116:ARG:O	14:N:116:ARG:HG3	2.18	0.44
2:D:110:GLN:CD	2:D:110:GLN:H	2.24	0.44
4:A:641:MET:O	4:A:645:THR:HG23	2.18	0.44
4:A:441:VAL:HG13	4:A:444:ARG:NH2	2.33	0.44
4:A:151:MET:HB2	4:A:616:PHE:CE1	2.53	0.43
4:A:156:ARG:HG2	4:A:620:PRO:HB2	1.99	0.43
4:A:590:GLY:O	4:A:593:ARG:HD3	2.18	0.43
4:A:1618:LYS:HA	4:A:1618:LYS:HD3	1.84	0.43
4:A:1723:LYS:HB3	4:A:1724:PRO:HD3	1.99	0.43
4:A:780:THR:HG22	4:A:898:PHE:CD2	2.53	0.43
4:A:885:LEU:O	4:A:889:ARG:NH1	2.51	0.43
8:C:314:TYR:HE1	8:C:413:ARG:HE	1.66	0.43
8:C:646:LYS:HA	8:C:646:LYS:HD3	1.82	0.43
9:5:52:U:O5'	14:N:123:ARG:NH2	2.51	0.43
9:5:68:C:H2'	9:5:69:A:C4	2.52	0.43
4:A:780:THR:HG22	4:A:898:PHE:HB2	2.01	0.43
4:A:973:CYS:SG	4:A:974:ASN:N	2.91	0.43
3:L:357:ARG:O	3:L:361:LYS:N	2.47	0.43
4:A:1034:LEU:HB2	4:A:1037:ALA:HB2	1.99	0.43
4:A:1288:LEU:HA	4:A:1291:CYS:SG	2.58	0.43
4:A:498:ARG:HA	4:A:498:ARG:HD2	1.84	0.43
4:A:676:ARG:O	4:A:680:HIS:N	2.39	0.43
4:A:883:ARG:O	4:A:887:THR:OG1	2.27	0.43
4:A:1872:LEU:O	4:A:1876:LEU:N	2.50	0.43
8:C:413:ARG:HB2	8:C:414:PRO:HD3	1.99	0.43
4:A:85:LYS:HG2	4:A:86:ARG:N	2.34	0.43
4:A:1257:THR:HA	4:A:1260:VAL:HG12	2.01	0.43
4:A:1536:LEU:HG	4:A:1751:LEU:HD11	2.00	0.43
10:4:51:A:H2'	10:4:52:U:C6	2.53	0.43
4:A:136:ILE:HD12	4:A:136:ILE:H	1.83	0.43
4:A:857:ASN:O	4:A:861:ARG:N	2.44	0.43
8:C:138:LEU:HG	8:C:140:HIS:H	1.84	0.43
8:C:705:VAL:HG21	8:C:717:PHE:CE2	2.54	0.43
4:A:601:GLN:HE22	4:A:637:TRP:CD1	2.36	0.43
4:A:1261:ASN:HA	4:A:1264:ASN:HD22	1.83	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:309:LEU:HD12	1:G:309:LEU:H	1.83	0.43
1:G:331:GLU:O	1:G:335:GLN:HG2	2.19	0.43
4:A:718:ARG:HA	4:A:721:LYS:HD3	2.01	0.43
4:A:1342:TRP:CE2	4:A:1353:PHE:HB2	2.54	0.43
8:C:258:ASN:HA	8:C:310:SER:O	2.19	0.43
9:5:75:G:H2'	9:5:76:A:C8	2.54	0.43
8:C:350:ASN:O	8:C:354:ARG:HA	2.19	0.42
4:A:579:GLN:HE22	4:A:609:LYS:HG3	1.83	0.42
4:A:1097:ILE:HD12	4:A:1099:PHE:CZ	2.54	0.42
15:B:76:GLU:HA	15:B:79:HIS:CE1	2.54	0.42
2:D:12:TRP:NE1	14:N:14:PRO:HD2	2.34	0.42
4:A:510:ARG:NH2	14:N:36:PRO:O	2.51	0.42
4:A:785:LYS:O	4:A:789:GLU:OE1	2.36	0.42
4:A:1037:ALA:HA	4:A:1040:ILE:HG12	2.02	0.42
4:A:1086:ARG:NH2	4:A:1100:ARG:O	2.51	0.42
4:A:601:GLN:NE2	4:A:605:CYS:SG	2.93	0.42
4:A:738:MET:HA	14:N:145:LEU:HD23	2.01	0.42
6:U:202:ILE:O	6:U:206:ASP:N	2.44	0.42
4:A:536:LYS:HA	4:A:536:LYS:HD2	1.82	0.42
6:U:146:ARG:H	6:U:150:SER:CB	2.33	0.42
8:C:742:PRO:HG2	8:C:785:ARG:NH1	2.35	0.42
8:C:848:THR:O	8:C:851:ALA:HB3	2.20	0.42
9:5:53:U:H2'	9:5:54:U:C6	2.54	0.42
4:A:119:LEU:O	4:A:128:PHE:N	2.38	0.42
4:A:427:VAL:HA	4:A:430:TRP:CD1	2.55	0.42
4:A:759:GLU:HA	4:A:762:ARG:HG2	2.02	0.42
4:A:1622:MET:HE3	4:A:1622:MET:HB3	1.90	0.42
8:C:135:CYS:O	8:C:228:PHE:HB2	2.20	0.42
8:C:884:GLU:CD	8:C:888:ARG:HH21	2.27	0.42
9:5:61:A:H2'	9:5:62:G:C8	2.54	0.42
10:4:57:G:N2	13:6:55:C:N3	2.59	0.42
4:A:1185:LEU:O	4:A:1195:ARG:HA	2.19	0.42
8:C:260:ILE:H	8:C:311:SER:HA	1.85	0.42
8:C:772:TRP:CZ3	8:C:813:ARG:HD3	2.54	0.42
8:C:800:PRO:HA	8:C:803:ARG:HD2	2.02	0.42
3:L:356:GLY:HA2	13:6:55:C:H41	1.85	0.42
4:A:188:LEU:HD23	4:A:188:LEU:HA	1.93	0.42
9:5:42:U:H3	12:z:-3:A:H61	1.67	0.42
9:5:63:A:H2'	9:5:64:G:C8	2.54	0.42
2:D:128:GLY:N	12:z:4:A:O2'	2.51	0.42
4:A:1285:LEU:HD13	15:B:43:LEU:HD22	2.01	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:1706:ASP:O	4:A:1710:ASN:CA	2.68	0.42
7:S:726:PHE:HA	7:S:729:LEU:HD12	2.01	0.42
1:G:348:ALA:O	1:G:351:ARG:HG3	2.20	0.42
4:A:218:LYS:HA	4:A:218:LYS:HD3	1.82	0.42
4:A:885:LEU:HD11	4:A:1005:ILE:HA	2.02	0.42
9:5:4:C:N4	9:5:77:G:O6	2.52	0.42
10:4:44:A:O3'	10:4:45:G:H4'	2.20	0.42
4:A:109:PRO:HD3	4:A:630:TRP:CZ2	2.55	0.41
4:A:461:HIS:C	4:A:462:ARG:HD3	2.46	0.41
4:A:1369:TYR:O	15:B:53:GLY:N	2.39	0.41
6:U:420:ALA:O	6:U:424:GLY:N	2.51	0.41
8:C:181:ILE:HA	8:C:211:PHE:HE2	1.85	0.41
16:7:473:ARG:HH12	16:7:484:ILE:HG12	1.85	0.41
4:A:133:PRO:HB2	4:A:421:ALA:HB3	2.02	0.41
4:A:142:SER:HA	4:A:242:ALA:HB2	2.02	0.41
6:U:145:GLY:HA3	6:U:152:ALA:H	1.85	0.41
8:C:129:ILE:O	8:C:441:PRO:HD3	2.19	0.41
4:A:428:LYS:HA	4:A:431:TYR:CE1	2.56	0.41
4:A:608:LEU:HD12	4:A:609:LYS:N	2.35	0.41
4:A:1668:TRP:CE2	4:A:1708:ALA:HB2	2.56	0.41
4:A:120:TYR:HA	4:A:127:SER:HA	2.01	0.41
4:A:453:TYR:HE1	4:A:600:ARG:HD2	1.85	0.41
4:A:560:SER:O	4:A:563:GLN:HG3	2.20	0.41
2:D:25:VAL:HG11	2:D:116:ILE:HD11	2.02	0.41
4:A:182:ILE:HA	4:A:565:ARG:CZ	2.50	0.41
4:A:1134:TRP:CH2	4:A:1195:ARG:HG2	2.55	0.41
8:C:490:PHE:CZ	8:C:609:LYS:HD2	2.55	0.41
8:C:742:PRO:HB2	8:C:786:ASN:H	1.85	0.41
4:A:452:LYS:O	4:A:456:LEU:HD23	2.20	0.41
4:A:203:VAL:O	4:A:207:PHE:HB2	2.21	0.41
8:C:736:GLY:H	8:C:770:PHE:HE2	1.67	0.41
1:G:311:GLN:O	1:G:315:GLU:N	2.42	0.41
3:L:378:MET:N	4:A:1503:TRP:O	2.51	0.41
4:A:347:LEU:HG	4:A:348:PRO:HD2	2.03	0.41
4:A:586:GLY:O	4:A:590:GLY:HA2	2.21	0.41
4:A:1097:ILE:HD12	4:A:1099:PHE:CE1	2.56	0.41
4:A:1173:SER:OG	4:A:1174:PHE:N	2.54	0.41
4:A:1296:GLN:O	4:A:1300:LYS:HG3	2.21	0.41
4:A:1412:TRP:CD2	15:B:61:PRO:HG3	2.56	0.41
8:C:299:ILE:O	8:C:306:ASN:ND2	2.53	0.41
10:4:15:G:H2'	10:4:16:C:C6	2.56	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:752:ASN:HA	4:A:755:HIS:NE2	2.36	0.41
4:A:1853:PRO:O	4:A:1857:GLN:N	2.52	0.41
8:C:771:GLN:O	8:C:775:ARG:HG3	2.21	0.41
10:4:16:C:H2'	10:4:17:A:O4'	2.21	0.41
15:B:51:ARG:HB3	15:B:51:ARG:HH11	1.86	0.41
4:A:119:LEU:HD23	4:A:130:ASN:HB3	2.03	0.40
4:A:387:PHE:HD2	8:C:376:PRO:HG2	1.86	0.40
4:A:1369:TYR:CE1	15:B:43:LEU:HD11	2.55	0.40
8:C:139:HIS:ND1	8:C:206:PRO:HA	2.36	0.40
10:4:8:C:H2'	10:4:9:G:C8	2.56	0.40
4:A:1088:PHE:HD1	4:A:1097:ILE:HG22	1.86	0.40
4:A:1660:TYR:CZ	4:A:1700:GLY:HA2	2.56	0.40
6:U:107:TYR:O	6:U:111:ILE:N	2.55	0.40
10:4:75:C:H1'	13:6:35:A:N1	2.37	0.40
4:A:147:MET:O	4:A:151:MET:HG2	2.21	0.40
4:A:170:ASP:OD1	4:A:171:ASP:N	2.54	0.40
13:6:52:U:H2'	13:6:53:A:H8	1.87	0.40
4:A:183:LEU:HD23	4:A:183:LEU:HA	1.92	0.40
4:A:777:GLY:O	4:A:780:THR:OG1	2.35	0.40
5:R:409:LYS:HD2	5:R:409:LYS:HA	1.90	0.40
8:C:271:PRO:HG3	8:C:378:TYR:CD2	2.57	0.40
10:4:34:G:H4'	10:4:46:G:O2'	2.21	0.40
2:D:14:VAL:HA	2:D:59:TYR:HE2	1.86	0.40
4:A:491:GLU:O	4:A:494:LEU:HG	2.21	0.40
4:A:1962:THR:HA	4:A:1969:PRO:HA	2.03	0.40
6:U:166:ASN:H	6:U:171:LYS:H	1.70	0.40
9:5:37:G:H1	9:5:45:C:N4	2.20	0.40
14:N:137:LYS:HB3	16:7:476:ILE:HA	2.03	0.40
15:B:51:ARG:HB3	15:B:51:ARG:NH1	2.36	0.40

There are no symmetry-related clashes.

5.3   Torsion angles ⓘ

5.3.1   Protein backbone ⓘ

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	G	98/820 (12%)	96 (98%)	2 (2%)	0	100	100
2	D	139/142 (98%)	136 (98%)	3 (2%)	0	100	100
3	L	48/499 (10%)	48 (100%)	0	0	100	100
4	A	1943/2335 (83%)	1861 (96%)	81 (4%)	1 (0%)	48	82
5	R	104/480 (22%)	101 (97%)	3 (3%)	0	100	100
6	U	454/565 (80%)	441 (97%)	13 (3%)	0	100	100
7	S	69/800 (9%)	68 (99%)	1 (1%)	0	100	100
8	C	834/972 (86%)	814 (98%)	20 (2%)	0	100	100
11	X	20/155 (13%)	20 (100%)	0	0	100	100
14	N	127/941 (14%)	125 (98%)	2 (2%)	0	100	100
15	B	66/2136 (3%)	66 (100%)	0	0	100	100
16	7	34/793 (4%)	34 (100%)	0	0	100	100
All	All	3936/10638 (37%)	3810 (97%)	125 (3%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	A	80	LYS

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	G	35/721 (5%)	35 (100%)	0	100	100
2	D	82/130 (63%)	82 (100%)	0	100	100
3	L	3/424 (1%)	3 (100%)	0	100	100
4	A	877/2108 (42%)	876 (100%)	1 (0%)	92	94
5	R	40/369 (11%)	40 (100%)	0	100	100
6	U	26/511 (5%)	26 (100%)	0	100	100
7	S	23/681 (3%)	23 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
8	C	266/866 (31%)	266 (100%)	0	100	100
11	X	3/144 (2%)	3 (100%)	0	100	100
14	N	29/792 (4%)	29 (100%)	0	100	100
15	B	12/1908 (1%)	12 (100%)	0	100	100
16	7	11/709 (2%)	11 (100%)	0	100	100
All	All	1407/9363 (15%)	1406 (100%)	1 (0%)	92	94

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	A	616	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	G	248	HIS
4	A	243	ASN
4	A	328	HIS
4	A	357	ASN
4	A	495	GLN
4	A	545	HIS
4	A	610	HIS
4	A	723	ASN
4	A	1083	HIS
4	A	1261	ASN
4	A	1586	HIS
5	R	463	ASN
7	S	731	HIS

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
10	4	74/144 (51%)	16 (21%)	2 (2%)
12	z	10/11 (90%)	5 (50%)	0
13	6	41/106 (38%)	5 (12%)	0
9	5	76/117 (64%)	27 (35%)	1 (1%)
All	All	201/378 (53%)	53 (26%)	3 (1%)

All (53) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
9	5	8	G
9	5	9	G
9	5	10	U
9	5	12	U
9	5	14	U
9	5	18	C
9	5	19	A
9	5	20	G
9	5	21	A
9	5	22	U
9	5	23	C
9	5	24	G
9	5	28	A
9	5	38	C
9	5	39	C
9	5	40	U
9	5	41	U
9	5	42	U
9	5	44	A
9	5	45	C
9	5	47	A
9	5	56	C
9	5	57	G
9	5	68	C
9	5	69	A
9	5	78	U
9	5	79	C
10	4	2	G
10	4	18	G
10	4	19	U
10	4	25	A
10	4	26	G
10	4	30	A
10	4	31	U
10	4	32	G
10	4	36	U
10	4	39	A
10	4	40	U
10	4	41	C
10	4	44	A
10	4	45	G
10	4	68	A

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Mol	Chain	Res	Type
10	4	69	C
12	z	-2	A
12	z	1	G
12	z	2	U
12	z	3	A
12	z	7	A
13	6	45	A
13	6	46	G
13	6	47	A
13	6	48	A
13	6	49	G

All (3) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
9	5	19	A
10	4	1	A
10	4	68	A

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 ⓘ

1 ligand is modelled in this entry.

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	IHP	A	2401	-	36,36,36	1.20	4 (11%)	54,60,60	1.64	6 (11%)

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	IHP	A	2401	-	-	1/30/54/54	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
17	A	2401	IHP	P5-O15	2.60	1.64	1.59
17	A	2401	IHP	P1-O11	2.26	1.63	1.59
17	A	2401	IHP	C4-C3	2.19	1.56	1.52
17	A	2401	IHP	C5-C4	2.17	1.56	1.52

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
17	A	2401	IHP	C5-C6-C1	5.05	121.47	110.41
17	A	2401	IHP	C3-C2-C1	4.61	120.50	110.41
17	A	2401	IHP	C5-C4-C3	4.38	120.01	110.41
17	A	2401	IHP	C4-C3-C2	3.47	118.00	110.41
17	A	2401	IHP	O15-C5-C4	2.42	114.40	108.69
17	A	2401	IHP	C6-C1-C2	2.20	115.23	110.41

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
17	A	2401	IHP	C5-O15-P5-O25

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is

within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand IHP A 2401

| Bond lengths | Bond angles |
| Torsions | Rings |
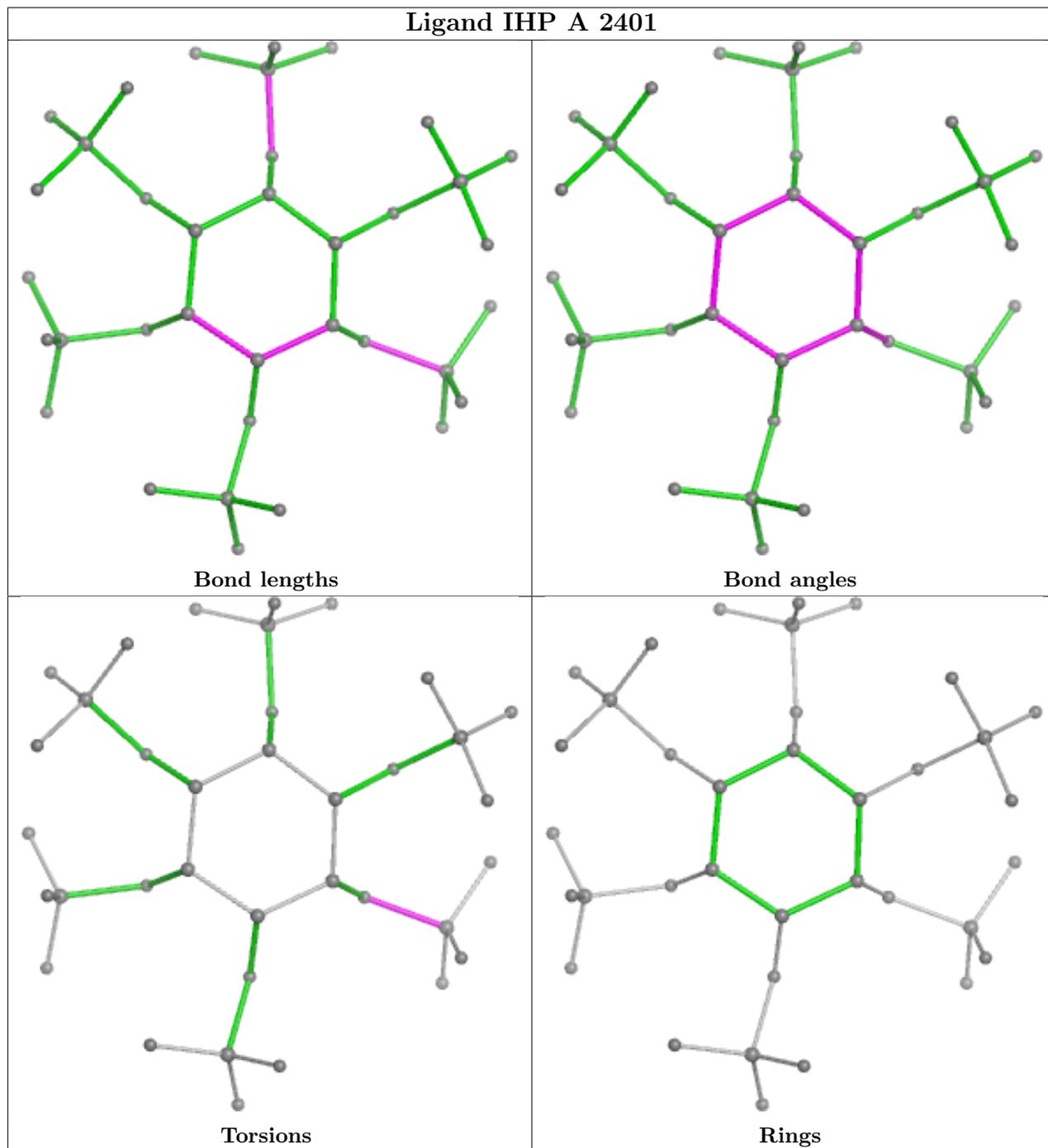
5.7　Other polymers ⓘ

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-18555. 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 ⓘ
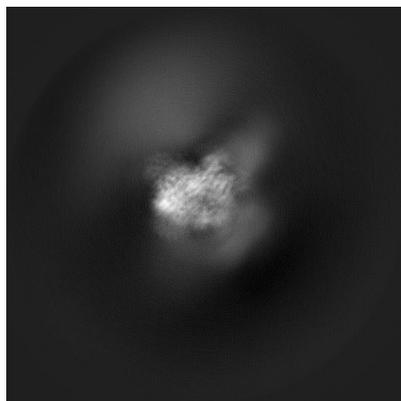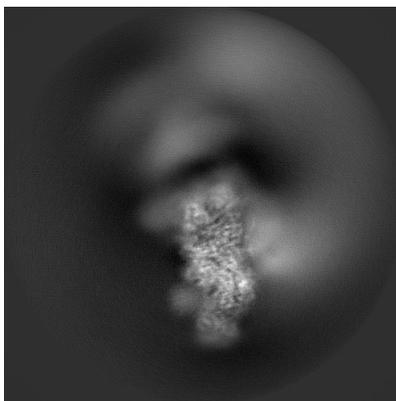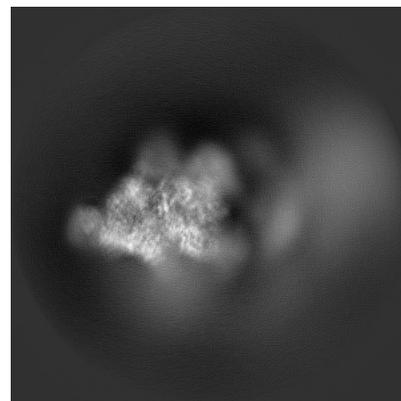
6.1.1 Primary map

| X | Y | Z |

6.1.2 Raw map

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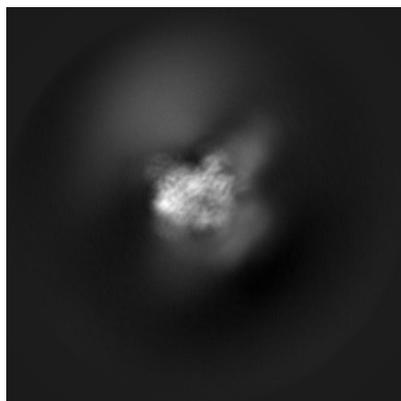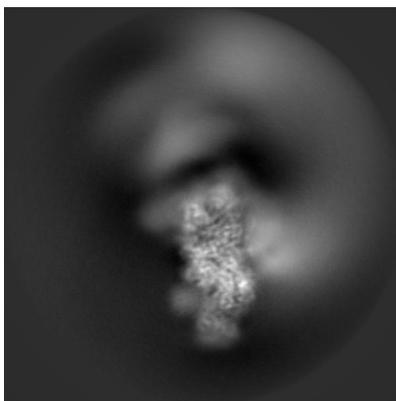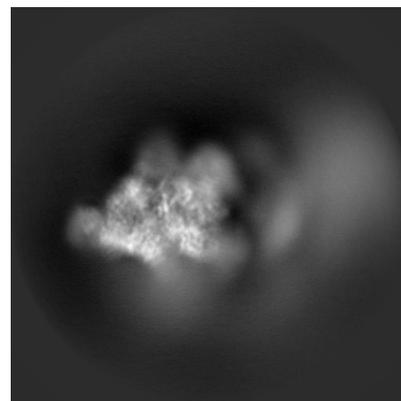
The images above show the map projected in three orthogonal directions.

6.2   Central slices ⓘ
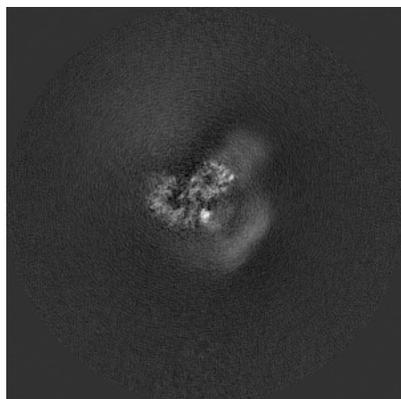
6.2.1   Primary map
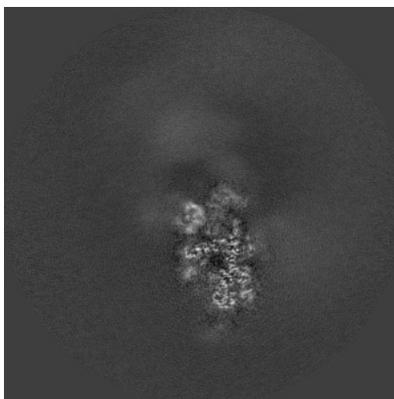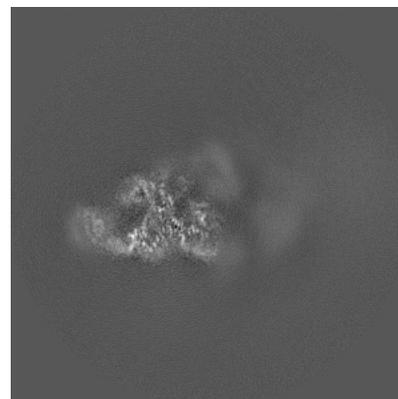
X Index: 250   Y Index: 250   Z Index: 250

6.2.2   Raw map
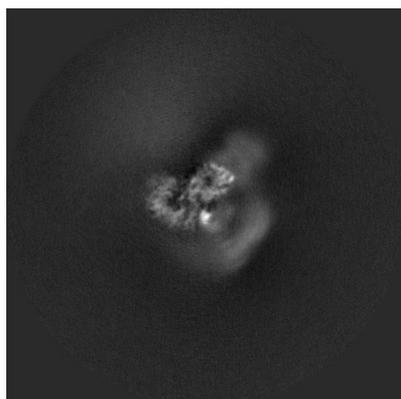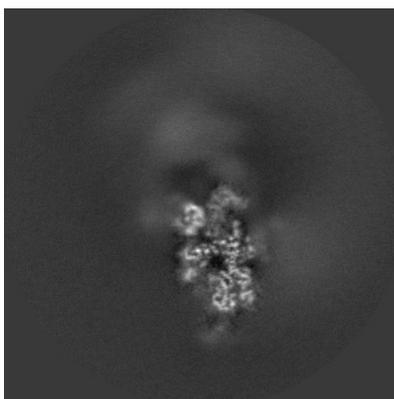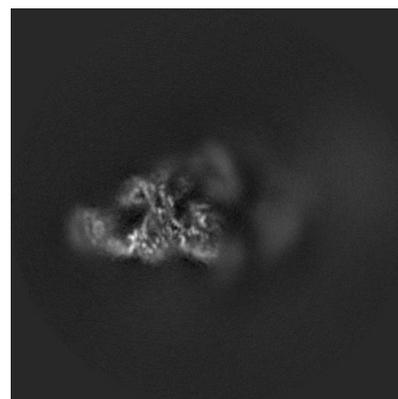
X Index: 250   Y Index: 250   Z Index: 250

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

6.3   Largest variance slices (i)

6.3.1   Primary map
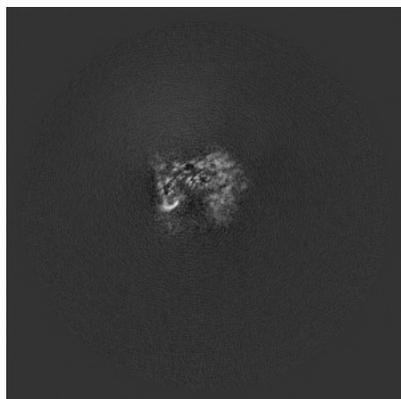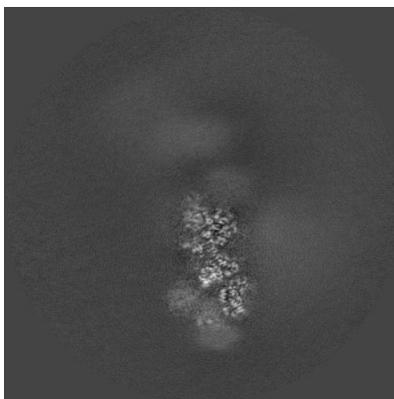
| X Index: 153 | Y Index: 214 | Z Index: 276 |
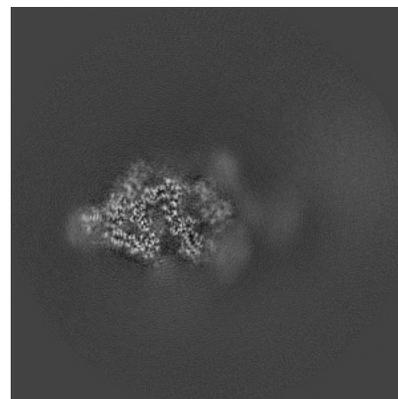
6.3.2   Raw map
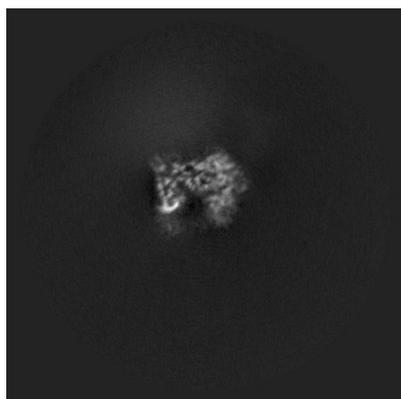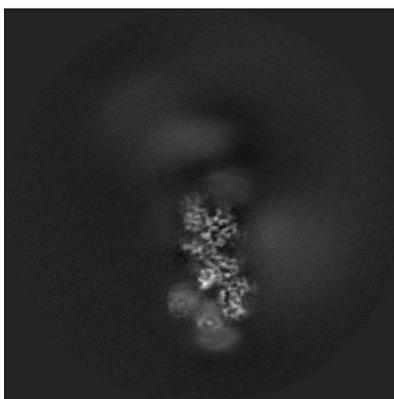
| X Index: 153 | Y Index: 213 | Z Index: 276 |
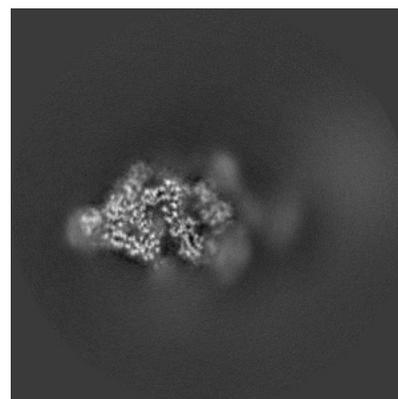
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map

| X | Y | Z |

6.4.2 Raw map

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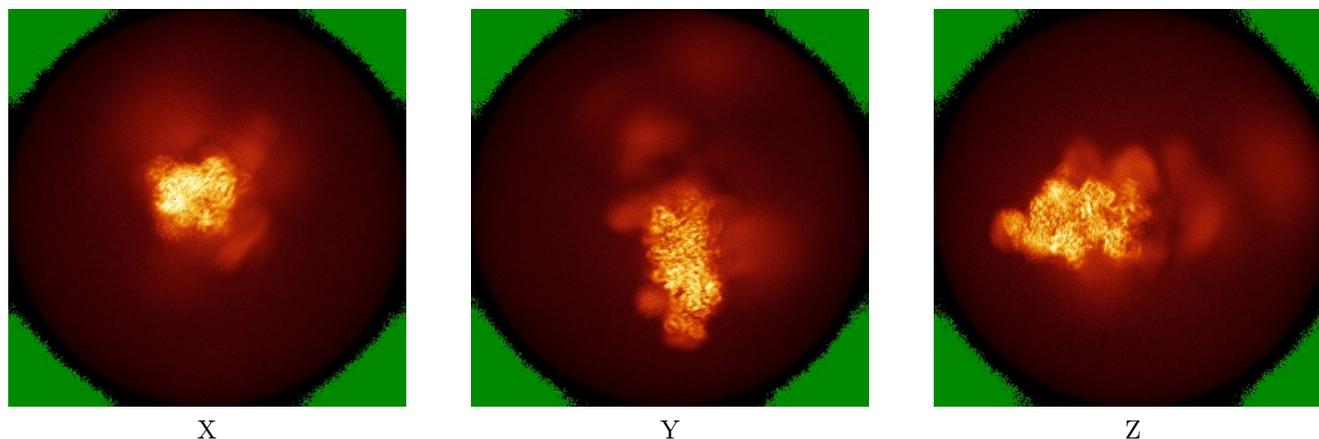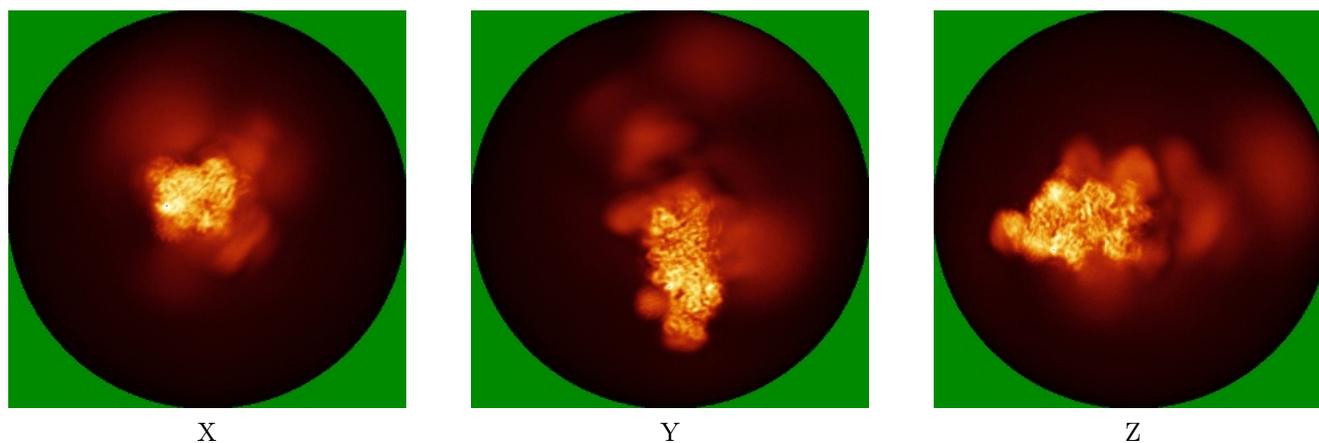
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views (i)

6.5.1 Primary map

X   Y   Z
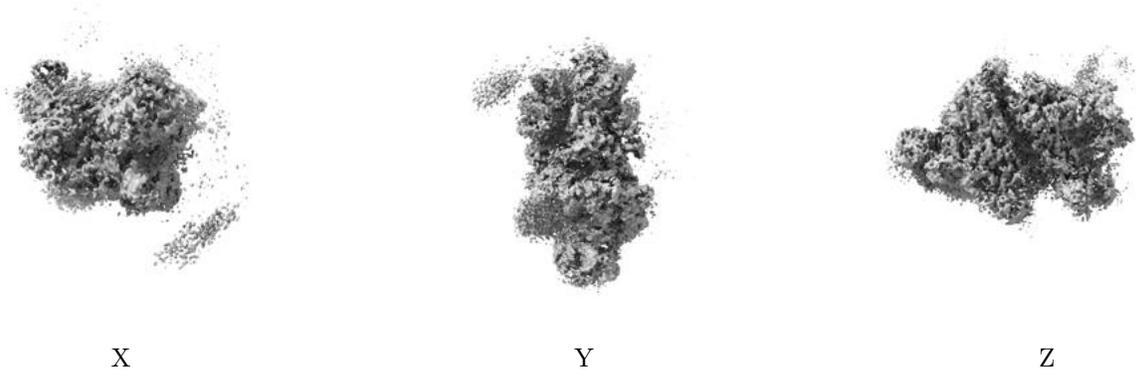
The images above show the 3D surface view of the map at the recommended contour level 0.0165. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map

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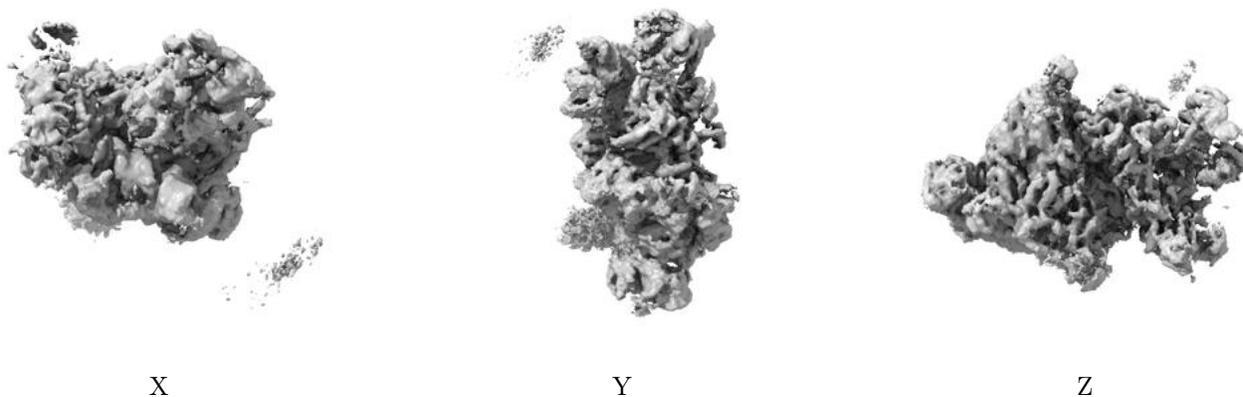
These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

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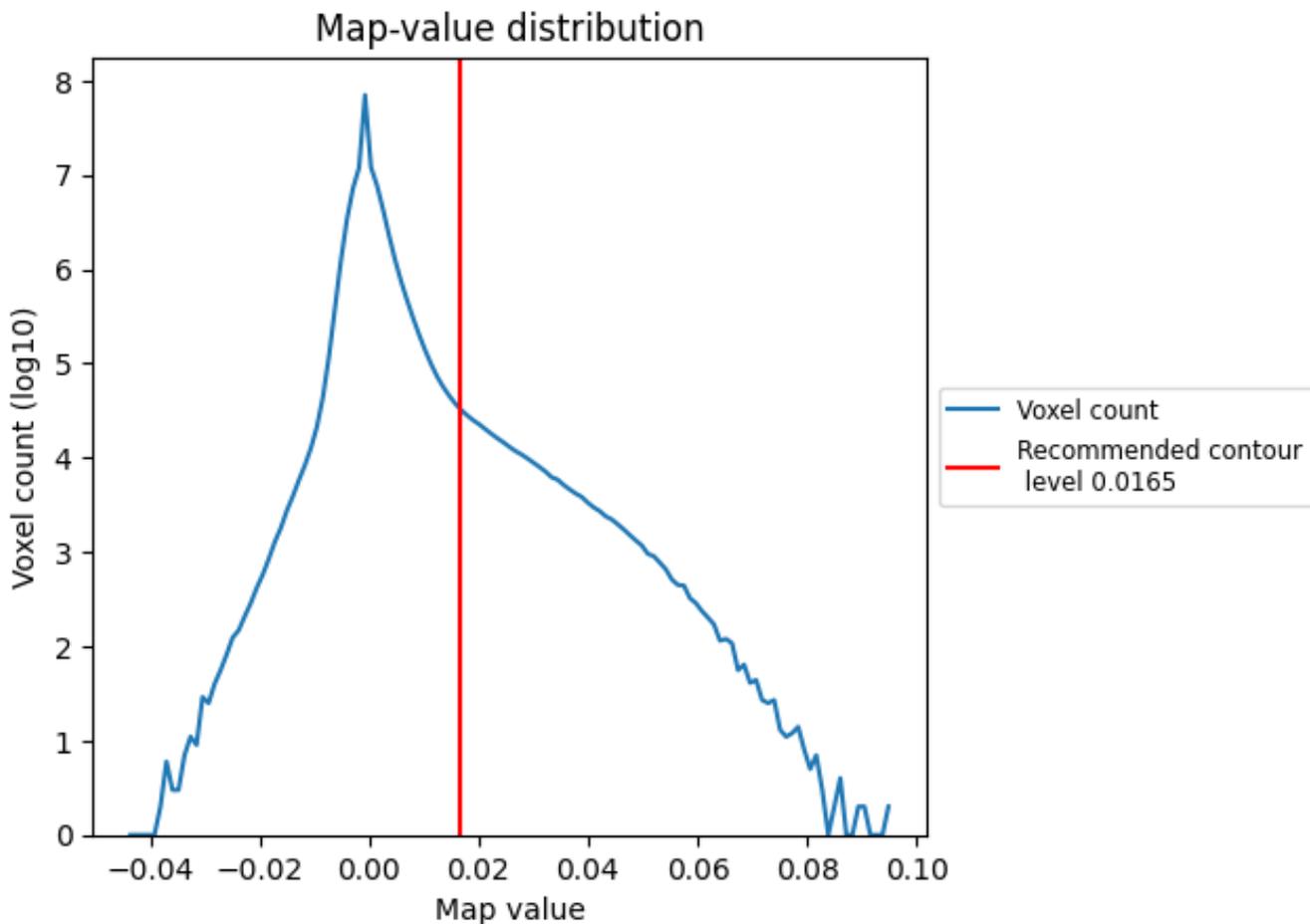
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2   Volume estimate ⓘ
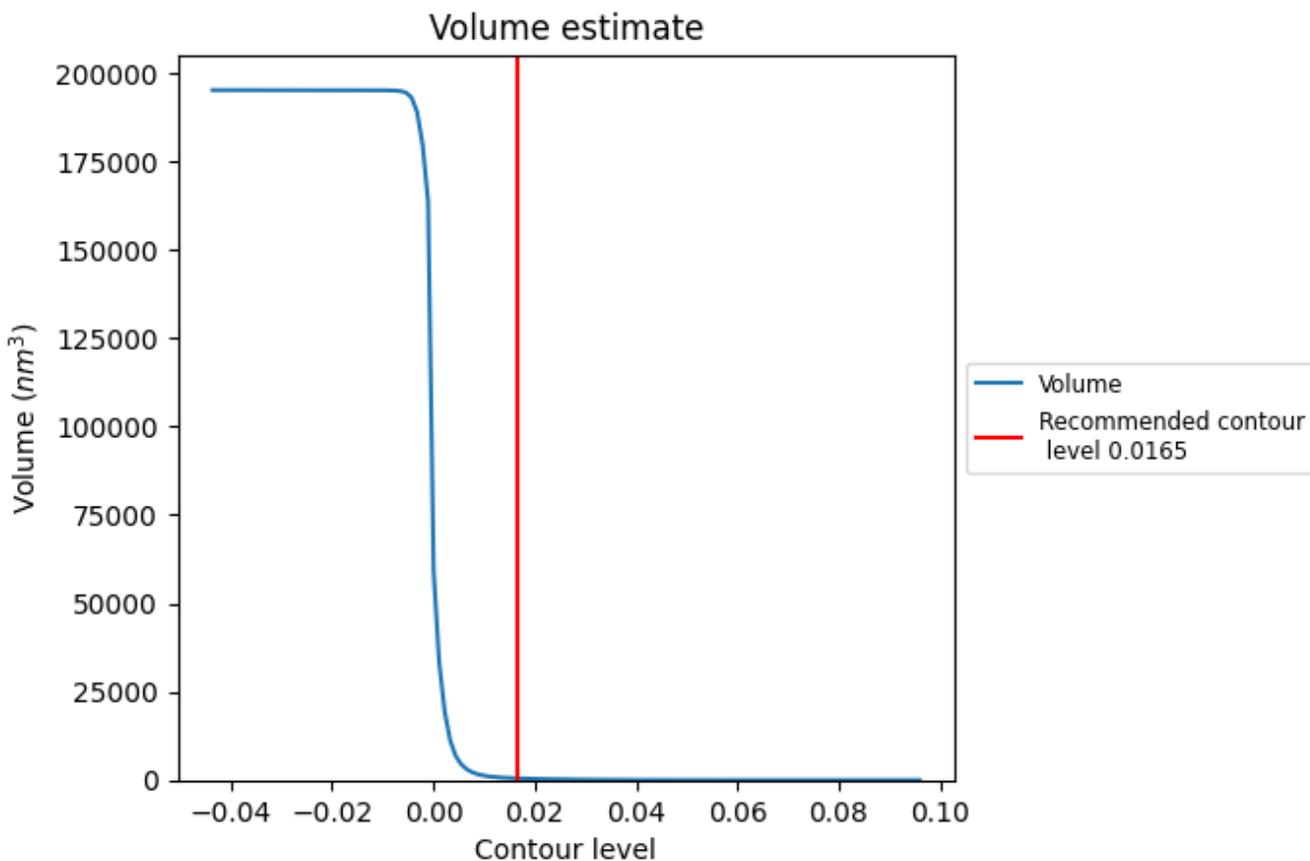
The volume at the recommended contour level is 494 nm³; this corresponds to an approximate mass of 446 kDa.

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 ⓘ
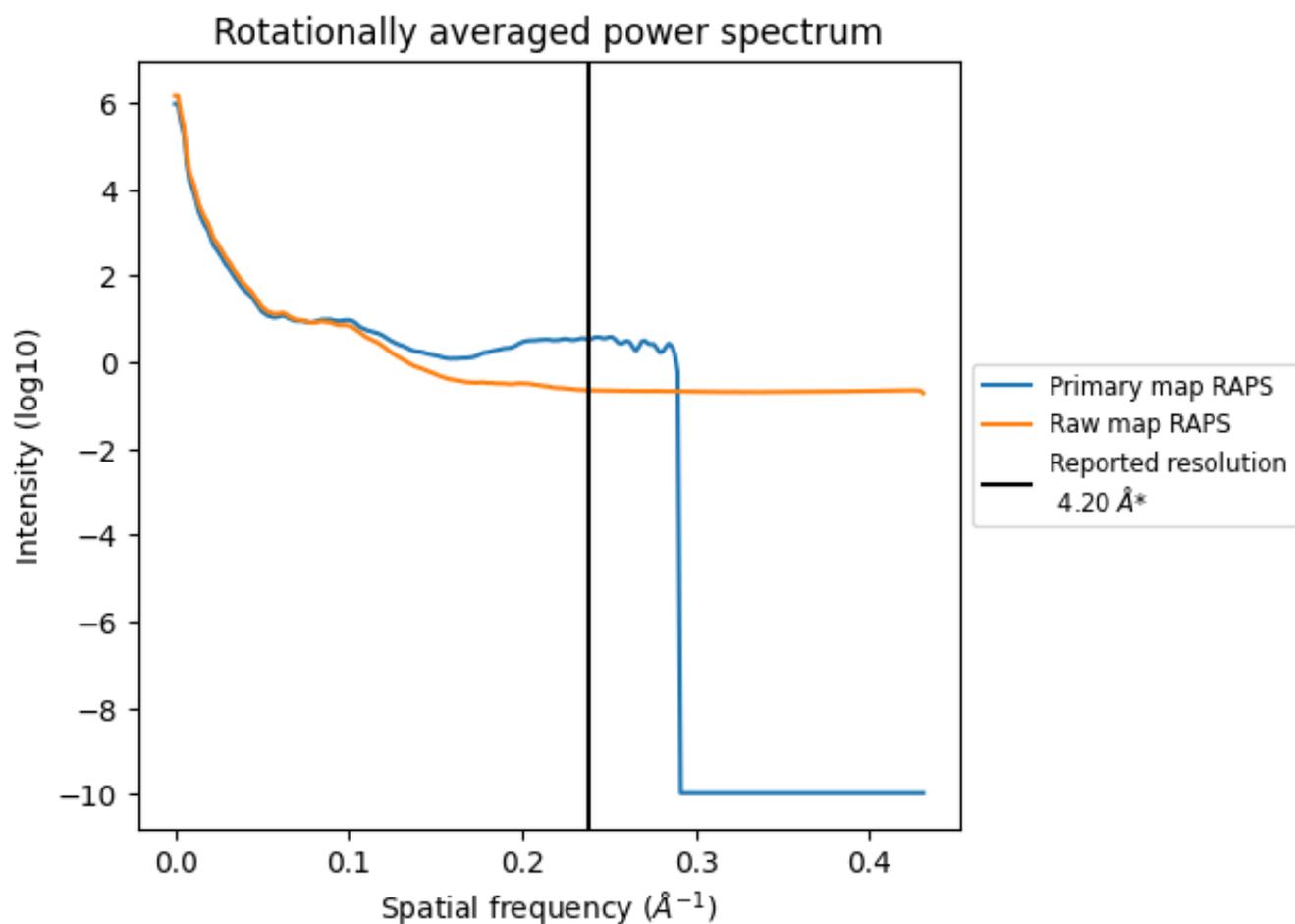
*Reported resolution corresponds to spatial frequency of 0.238 Å^{-1}

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 ⓘ
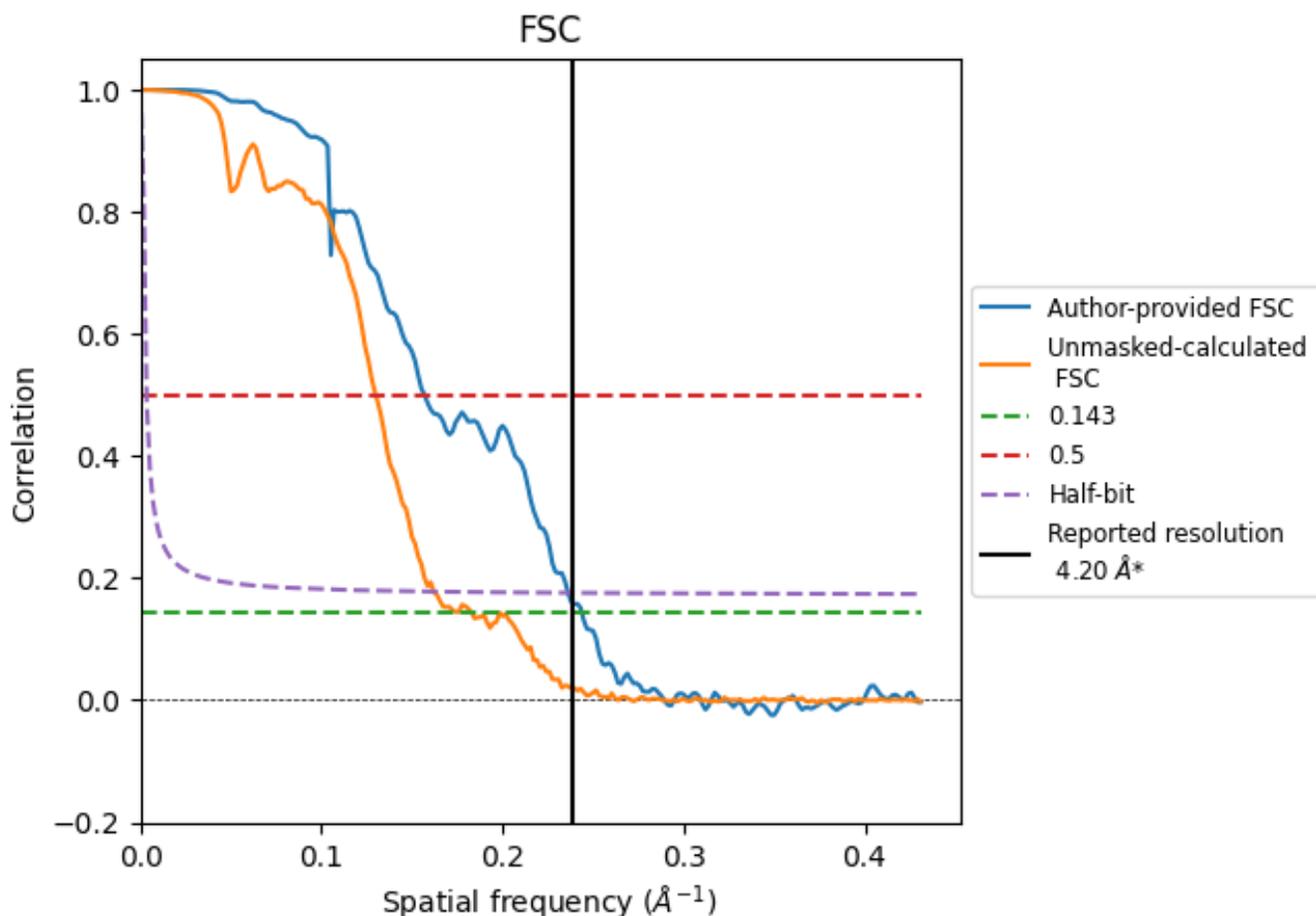
*Reported resolution corresponds to spatial frequency of 0.238 Å^{-1}

8.2　Resolution estimates ⓘ

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.20	-	-
Author-provided FSC curve	4.10	6.37	4.23
Unmasked-calculated*	5.46	7.69	6.18

*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 5.46 differs from the reported value 4.2 by more than 10 %

9 Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-18555 and PDB model 8QPK. Per-residue inclusion information can be found in section 3 on page 7.

9.1 Map-model overlay ⓘ
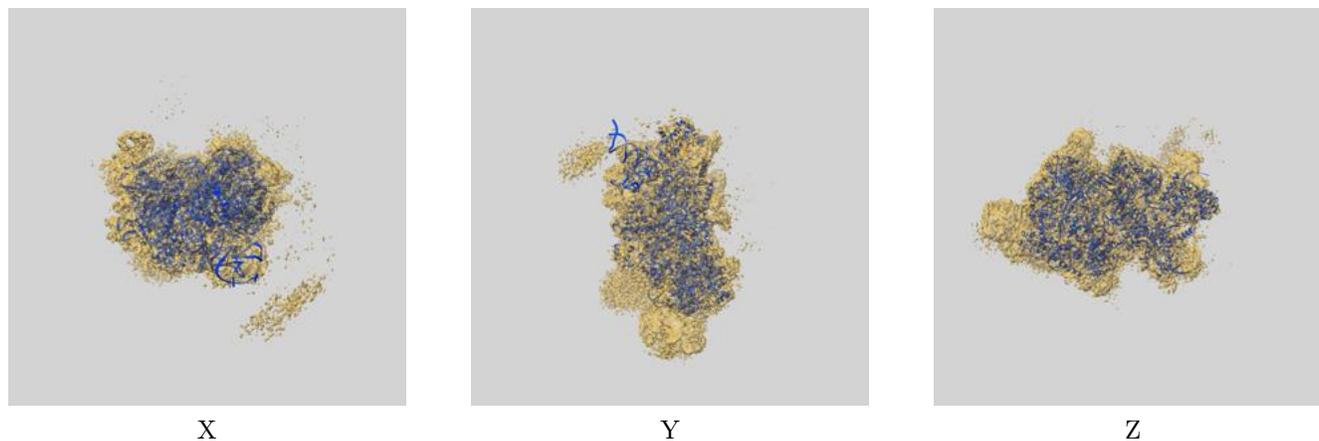
X

Y

Z

The images above show the 3D surface view of the map at the recommended contour level 0.0165 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 ⓘ
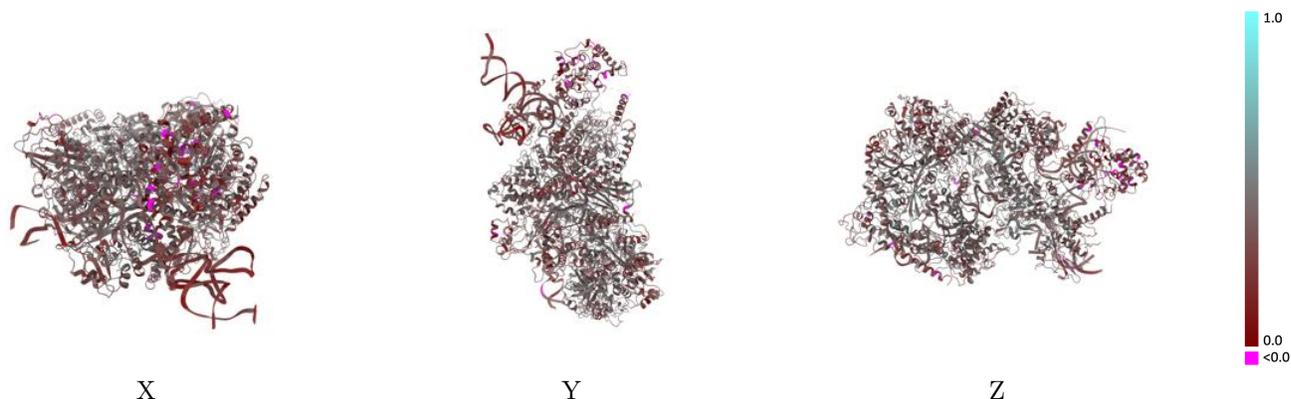
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 ⓘ
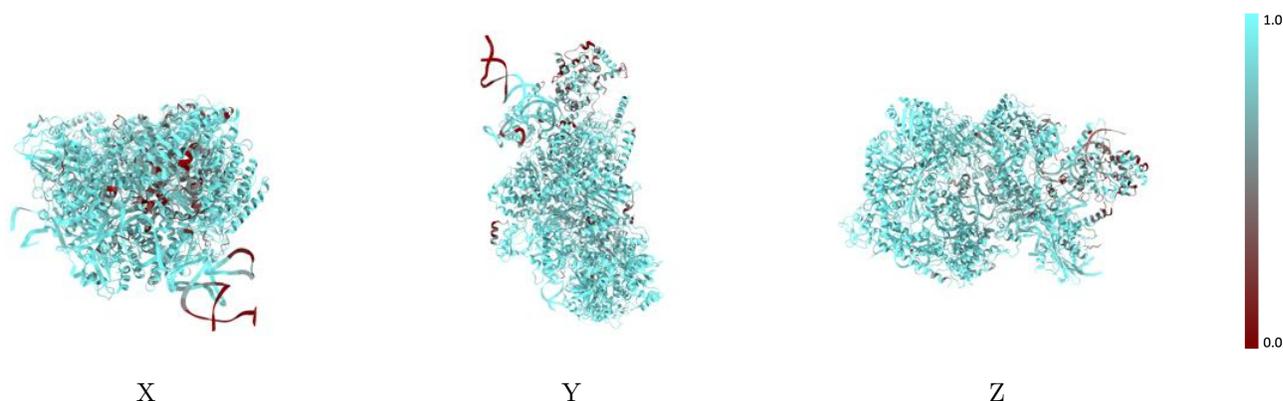
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.0165).

9.4   Atom inclusion (i)
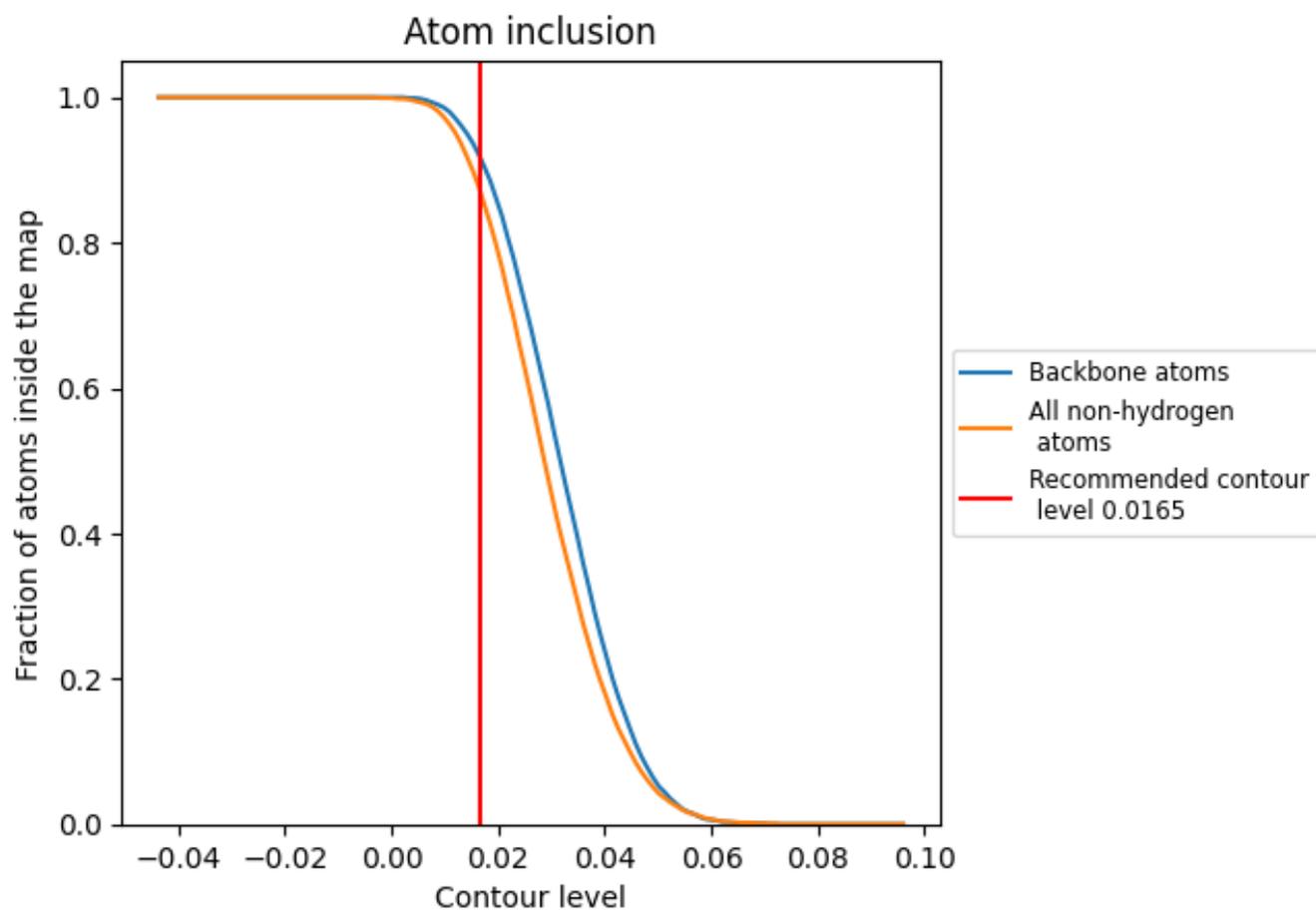
At the recommended contour level, 92% of all backbone atoms, 88% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.0165) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8750	0.3650
4	0.7590	0.2470
5	0.9560	0.3240
6	0.7370	0.2920
7	0.8780	0.4000
A	0.8620	0.3820
B	0.7770	0.3570
C	0.9500	0.3930
D	0.8950	0.4320
G	0.8130	0.3570
L	0.6570	0.3490
N	0.9380	0.3830
R	0.9110	0.3380
S	0.7060	0.3240
U	0.9150	0.3240
X	0.7540	0.4020
z	0.9620	0.3970

1.0

0.0
<0.0