WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB EM Validation Summary Report (i)

Dec 18, 2025 – 04:31 PM JST

PDB ID	:	9WMV / pdb_00009wmv
EMDB ID	:	EMD-66106
Title	:	Co-transcriptional histone H3K36 methylation complex containing RNA polymerase II elongation complex, Set2, and the upstream nucleosome. (temp130, type B)
Authors	:	Kujirai, T.; Ehara, H.; Ito, T.; Henmi, M.; Sekine, S.; Kurumizaka, H.
Deposited on	:	2025-09-03
Resolution	:	4.66 Å(reported)

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

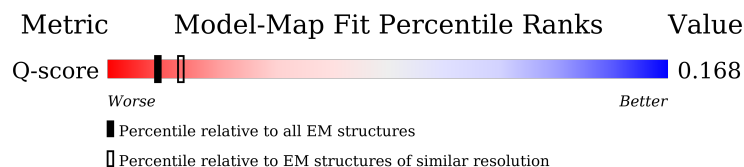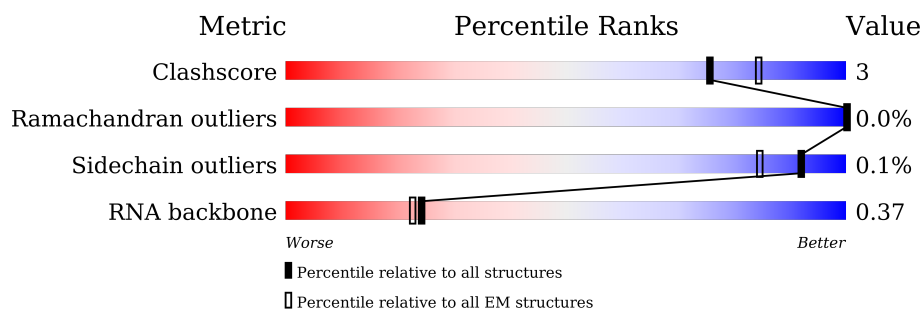|		
EMDB validation analysis	:	0.0.1.dev129
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.47

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 4.66 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		3
Ramachandran outliers		0.0%
Sidechain outliers		0.1%
RNA backbone		0.37

Worse   *Better*

▮ Percentile relative to all structures
❚ Percentile relative to all EM structures

Metric	Model-Map Fit Percentile Ranks	Value
Q-score		0.168

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	-
RNA backbone	6643	2191	-
Q-score	-	25397	2028 (4.16 - 5.16)

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.

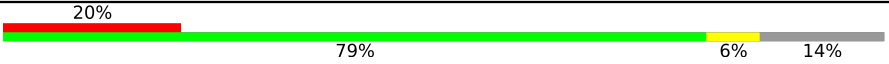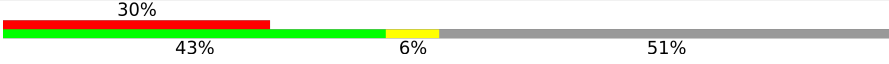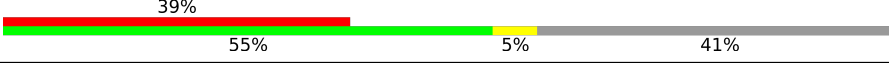| Mol	Chain	Length	Quality of chain
1	A	1743	75% 5% 19%
2	B	1227	87% 8% 5%
3	C	304	82% • 13%

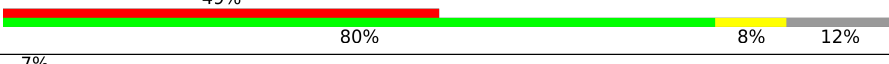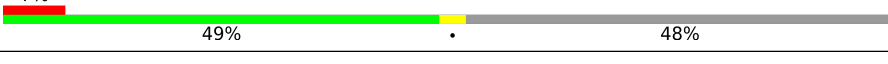*Continued on next page...*

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Mol	Chain	Length	Quality of chain
4	D	186	11% ... 89% ... 6%
5	E	214	93% ... 7%
6	F	155	52% ... 46%
7	G	171	9% ... 91% ... 9%
8	H	145	87% ... 5% ... 8%
9	I	115	83% ... 13%
10	J	72	90% ... 7%
11	K	118	84% ... 12%
12	L	72	61% ... 38%
13	M	113	5% ... 51% ... 5% ... 43%
14	N	198	37% ... 70% ... 15% ... 15%
15	P	19	5% ... 53% ... 26% ... 21%
16	T	198	41% ... 77% ... 14% ... 10%
17	V	108	9% ... 81% ... 17%
18	W	911	14% ... 51% ... 7% ... 41%
19	a	139	24% ... 69% ... 6% ... 25%
19	e	139	47% ... 60% ... 6% ... 35%
20	b	106	25% ... 72% ... 5% ... 24%
20	f	106	43% ... 71% ... 6% ... 24%
21	c	133	45% ... 72% ... 6% ... 22%
21	g	133	46% ... 74% ... 5% ... 20%
22	d	129	49% ... 65% ... 7% ... 28%
22	h	129	40% ... 67% ... 6% ... 27%
23	m	1503	30% ... 72% ... 6% ... 22%
24	n	417	10% ... 29% ... 5% ... 67%

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Mol	Chain	Length	Quality of chain
25	q	1084	20% 79% 6% 14%
26	r	544	30% 43% 6% 51%
27	s	725	39% 55% 5% 41%
28	u	459	23% 36% 5% 59%
29	v	396	49% 80% 8% 12%
30	x	395	7% 49% • 48%

2　Entry composition ⓘ

There are 33 unique types of molecules in this entry. The entry contains 80400 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 DNA-directed RNA polymerase subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	1404	Total 11064	C 6975	N 1930	O 2089	S 70	0	0

- Molecule 2 is a protein called DNA-directed RNA polymerase subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	1164	Total 9284	C 5848	N 1639	O 1739	S 58	0	0

- Molecule 3 is a protein called RNA polymerase II third largest subunit B44, part of central core.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	263	Total 2098	C 1319	N 354	O 413	S 12	0	0

- Molecule 4 is a protein called RNA polymerase II subunit B32.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	174	Total 1349	C 828	N 244	O 274	S 3	0	0

- Molecule 5 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC1.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	213	Total 1741	C 1094	N 312	O 325	S 10	0	0

- Molecule 6 is a protein called RNA polymerase subunit ABC23, common to RNA polymerases I, II, and III.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	84	Total 677	C 429	N 114	O 131	S 3	0	0

- Molecule 7 is a protein called RNA polymerase II subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	171	Total 1325	C 858	N 214	O 248	S 5	0	0

- Molecule 8 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC3.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	H	133	Total 1053	C 671	N 169	O 209	S 4	0	0

- Molecule 9 is a protein called DNA-directed RNA polymerase subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	I	111	Total 917	C 565	N 161	O 180	S 11	0	0

- Molecule 10 is a protein called RNA polymerase subunit ABC10-beta, common to RNA polymerases I, II, and III.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	J	67	Total 554	C 355	N 97	O 96	S 6	0	0

- Molecule 11 is a protein called RNA polymerase II subunit B12.5.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	K	113	Total 932	C 599	N 160	O 169	S 4	0	0

- Molecule 12 is a protein called RNA polymerase subunit ABC10-alpha.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	L	45	Total 359	C 221	N 72	O 61	S 5	0	0

- Molecule 13 is a protein called Transcription elongation factor 1 homolog.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	M	64	Total 505	C 318	N 82	O 99	S 6	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
M	-2	GLY	-	expression tag	UNP C4QZ45
M	-1	PRO	-	expression tag	UNP C4QZ45
M	0	GLY	-	expression tag	UNP C4QZ45

- Molecule 14 is a DNA chain called DNA (198-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
14	N	168	Total 3443	C 1649	N 547	O 1079	P 168	0	0

- Molecule 15 is a RNA chain called RNA (5'-R(P*GP*UP*CP*CP*UP*UP*UP*UP*GP*U
  P*GP*CP*GP*GP*CP*CP*UP*CP*G)-3').

Mol	Chain	Residues	Atoms					AltConf	Trace
15	P	19	Total 398	C 177	N 62	O 140	P 19	0	0

- Molecule 16 is a DNA chain called DNA (198-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
16	T	179	Total 3671	C 1731	N 759	O 1002	P 179	0	0

- Molecule 17 is a protein called Transcription elongation factor SPT4.

Mol	Chain	Residues	Atoms					AltConf	Trace
17	V	106	Total 824	C 512	N 150	O 155	S 7	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
V	7	MET	-	initiating methionine	UNP C4R0E6

- Molecule 18 is a protein called Transcription elongation factor SPT5.

Mol	Chain	Residues	Atoms					AltConf	Trace
18	W	535	Total 4250	C 2680	N 754	O 814	S 2	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
W	-2	GLY	-	expression tag	UNP C4R370
W	-1	PRO	-	expression tag	UNP C4R370
W	0	GLY	-	expression tag	UNP C4R370

- Molecule 19 is a protein called Histone H3.3.

Mol	Chain	Residues	Atoms					AltConf	Trace
19	a	104	Total 841	C 530	N 163	O 145	S 3	0	0
19	e	91	Total 739	C 466	N 141	O 130	S 2	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
a	-3	GLY	-	expression tag	UNP P84243
a	-2	SER	-	expression tag	UNP P84243
a	-1	HIS	-	expression tag	UNP P84243
a	36	MET	LYS	variant	UNP P84243
e	-3	GLY	-	expression tag	UNP P84243
e	-2	SER	-	expression tag	UNP P84243
e	-1	HIS	-	expression tag	UNP P84243
e	36	MET	LYS	variant	UNP P84243

- Molecule 20 is a protein called Histone H4.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	b	81	Total 646	C 407	N 126	O 112	S 1	0	0
20	f	81	Total 646	C 407	N 126	O 112	S 1	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
b	-3	GLY	-	expression tag	UNP P62805

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Chain	Residue	Modelled	Actual	Comment	Reference
b	-2	SER	-	expression tag	UNP P62805
b	-1	HIS	-	expression tag	UNP P62805
f	-3	GLY	-	expression tag	UNP P62805
f	-2	SER	-	expression tag	UNP P62805
f	-1	HIS	-	expression tag	UNP P62805

- Molecule 21 is a protein called Histone H2A type 1-B/E.

Mol	Chain	Residues	Atoms				AltConf	Trace
21	c	104	Total 805	C 508	N 157	O 140	0	0
21	g	106	Total 819	C 517	N 160	O 142	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
c	-3	GLY	-	expression tag	UNP P04908
c	-2	SER	-	expression tag	UNP P04908
c	-1	HIS	-	expression tag	UNP P04908
g	-3	GLY	-	expression tag	UNP P04908
g	-2	SER	-	expression tag	UNP P04908
g	-1	HIS	-	expression tag	UNP P04908

- Molecule 22 is a protein called Histone H2B type 1-J.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	d	93	Total 725	C 456	N 130	O 137	S 2	0	0
22	h	94	Total 735	C 462	N 132	O 139	S 2	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
d	-3	GLY	-	expression tag	UNP P06899
d	-2	SER	-	expression tag	UNP P06899
d	-1	HIS	-	expression tag	UNP P06899
h	-3	GLY	-	expression tag	UNP P06899
h	-2	SER	-	expression tag	UNP P06899
h	-1	HIS	-	expression tag	UNP P06899

- Molecule 23 is a protein called Transcription elongation factor Spt6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
23	m	1178	9653	6112	1648	1866	27	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
m	-2	GLY	-	expression tag	UNP C4R7H2
m	-1	PRO	-	expression tag	UNP C4R7H2
m	0	GLY	-	expression tag	UNP C4R7H2

- Molecule 24 is a protein called Protein that interacts with Spt6p and copurifies with Spt5p and RNA polymerase II.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
24	n	139	1115	716	193	202	4	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
n	-2	GLY	-	expression tag	UNP C4R7L8
n	-1	PRO	-	expression tag	UNP C4R7L8
n	0	GLY	-	expression tag	UNP C4R7L8

- Molecule 25 is a protein called Component of the Paf1p complex.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
25	q	930	7552	4805	1283	1439	25	0	0

There are 40 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
q	-39	MET	-	initiating methionine	UNP C4R6B2
q	-38	LYS	-	expression tag	UNP C4R6B2
q	-37	ASP	-	expression tag	UNP C4R6B2
q	-36	HIS	-	expression tag	UNP C4R6B2
q	-35	LEU	-	expression tag	UNP C4R6B2
q	-34	ILE	-	expression tag	UNP C4R6B2
q	-33	HIS	-	expression tag	UNP C4R6B2
q	-32	ASN	-	expression tag	UNP C4R6B2

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Chain	Residue	Modelled	Actual	Comment	Reference
q	-31	HIS	-	expression tag	UNP C4R6B2
q	-30	HIS	-	expression tag	UNP C4R6B2
q	-29	LYS	-	expression tag	UNP C4R6B2
q	-28	HIS	-	expression tag	UNP C4R6B2
q	-27	GLU	-	expression tag	UNP C4R6B2
q	-26	HIS	-	expression tag	UNP C4R6B2
q	-25	ALA	-	expression tag	UNP C4R6B2
q	-24	HIS	-	expression tag	UNP C4R6B2
q	-23	ALA	-	expression tag	UNP C4R6B2
q	-22	GLU	-	expression tag	UNP C4R6B2
q	-21	HIS	-	expression tag	UNP C4R6B2
q	-20	ASP	-	expression tag	UNP C4R6B2
q	-19	TYR	-	expression tag	UNP C4R6B2
q	-18	LYS	-	expression tag	UNP C4R6B2
q	-17	ASP	-	expression tag	UNP C4R6B2
q	-16	ASP	-	expression tag	UNP C4R6B2
q	-15	ASP	-	expression tag	UNP C4R6B2
q	-14	ASP	-	expression tag	UNP C4R6B2
q	-13	LYS	-	expression tag	UNP C4R6B2
q	-12	GLU	-	expression tag	UNP C4R6B2
q	-11	HIS	-	expression tag	UNP C4R6B2
q	-10	LEU	-	expression tag	UNP C4R6B2
q	-9	TYR	-	expression tag	UNP C4R6B2
q	-8	PHE	-	expression tag	UNP C4R6B2
q	-7	GLN	-	expression tag	UNP C4R6B2
q	-6	GLY	-	expression tag	UNP C4R6B2
q	-5	SER	-	expression tag	UNP C4R6B2
q	-4	SER	-	expression tag	UNP C4R6B2
q	-3	GLY	-	expression tag	UNP C4R6B2
q	-2	SER	-	expression tag	UNP C4R6B2
q	-1	SER	-	expression tag	UNP C4R6B2
q	0	GLY	-	expression tag	UNP C4R6B2

- Molecule 26 is a protein called RNAPII-associated chromatin remodeling Paf1 complex sub-unit.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
26	r	266	2139	1342	374	412	11	0	0

There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
r	-29	MET	-	initiating methionine	UNP F2QQ42
r	-28	LYS	-	expression tag	UNP F2QQ42
r	-27	ASP	-	expression tag	UNP F2QQ42
r	-26	HIS	-	expression tag	UNP F2QQ42
r	-25	LEU	-	expression tag	UNP F2QQ42
r	-24	ILE	-	expression tag	UNP F2QQ42
r	-23	HIS	-	expression tag	UNP F2QQ42
r	-22	ASN	-	expression tag	UNP F2QQ42
r	-21	HIS	-	expression tag	UNP F2QQ42
r	-20	HIS	-	expression tag	UNP F2QQ42
r	-19	LYS	-	expression tag	UNP F2QQ42
r	-18	HIS	-	expression tag	UNP F2QQ42
r	-17	GLU	-	expression tag	UNP F2QQ42
r	-16	HIS	-	expression tag	UNP F2QQ42
r	-15	ALA	-	expression tag	UNP F2QQ42
r	-14	HIS	-	expression tag	UNP F2QQ42
r	-13	ALA	-	expression tag	UNP F2QQ42
r	-12	GLU	-	expression tag	UNP F2QQ42
r	-11	HIS	-	expression tag	UNP F2QQ42
r	-10	LEU	-	expression tag	UNP F2QQ42
r	-9	TYR	-	expression tag	UNP F2QQ42
r	-8	PHE	-	expression tag	UNP F2QQ42
r	-7	GLN	-	expression tag	UNP F2QQ42
r	-6	GLY	-	expression tag	UNP F2QQ42
r	-5	SER	-	expression tag	UNP F2QQ42
r	-4	SER	-	expression tag	UNP F2QQ42
r	-3	GLY	-	expression tag	UNP F2QQ42
r	-2	SER	-	expression tag	UNP F2QQ42
r	-1	SER	-	expression tag	UNP F2QQ42
r	0	GLY	-	expression tag	UNP F2QQ42

- Molecule 27 is a protein called Histone-lysine N-methyltransferase, H3 lysine-36 specific.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
27	s	431	3419	2126	593	677	23	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
s	-2	GLY	-	expression tag	UNP C4QY01
s	-1	PRO	-	expression tag	UNP C4QY01
s	0	GLY	-	expression tag	UNP C4QY01

- Molecule 28 is a protein called Leo1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
28	u	188	1522	955	262	302	3	0	0

There are 30 discrepancies between the modelled and reference sequences:

| Chain	Residue	Modelled	Actual	Comment	Reference
u	-29	MET	-	initiating methionine	UNP C4R3K1
u	-28	LYS	-	expression tag	UNP C4R3K1
u	-27	ASP	-	expression tag	UNP C4R3K1
u	-26	HIS	-	expression tag	UNP C4R3K1
u	-25	LEU	-	expression tag	UNP C4R3K1
u	-24	ILE	-	expression tag	UNP C4R3K1
u	-23	HIS	-	expression tag	UNP C4R3K1
u	-22	ASN	-	expression tag	UNP C4R3K1
u	-21	HIS	-	expression tag	UNP C4R3K1
u	-20	HIS	-	expression tag	UNP C4R3K1
u	-19	LYS	-	expression tag	UNP C4R3K1
u	-18	HIS	-	expression tag	UNP C4R3K1
u	-17	GLU	-	expression tag	UNP C4R3K1
u	-16	HIS	-	expression tag	UNP C4R3K1
u	-15	ALA	-	expression tag	UNP C4R3K1
u	-14	HIS	-	expression tag	UNP C4R3K1
u	-13	ALA	-	expression tag	UNP C4R3K1
u	-12	GLU	-	expression tag	UNP C4R3K1
u	-11	HIS	-	expression tag	UNP C4R3K1
u	-10	LEU	-	expression tag	UNP C4R3K1
u	-9	TYR	-	expression tag	UNP C4R3K1
u	-8	PHE	-	expression tag	UNP C4R3K1
u	-7	GLN	-	expression tag	UNP C4R3K1
u	-6	GLY	-	expression tag	UNP C4R3K1
u	-5	SER	-	expression tag	UNP C4R3K1
u	-4	SER	-	expression tag	UNP C4R3K1
u	-3	GLY	-	expression tag	UNP C4R3K1
u	-2	SER	-	expression tag	UNP C4R3K1
u	-1	SER	-	expression tag	UNP C4R3K1
u	0	GLY	-	expression tag	UNP C4R3K1

- Molecule 29 is a protein called RNAP II-associated protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
29	v	349	Total	C	N	O	S	0	0
			2878	1835	510	528	5		

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
v	-2	GLY	-	expression tag	UNP C4R997
v	-1	SER	-	expression tag	UNP C4R997
v	0	ALA	-	expression tag	UNP C4R997

- Molecule 30 is a protein called Constituent of Paf1 complex with RNA polymerase II, Paf1p, Hpr1p, Ctr9, Leo1, Rtf1 and Ccr4p.

Mol	Chain	Residues	Atoms					AltConf	Trace
30	x	205	Total	C	N	O	S	0	0
			1682	1086	287	307	2		

There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
x	-29	MET	-	initiating methionine	UNP C4R1E6
x	-28	LYS	-	expression tag	UNP C4R1E6
x	-27	ASP	-	expression tag	UNP C4R1E6
x	-26	HIS	-	expression tag	UNP C4R1E6
x	-25	LEU	-	expression tag	UNP C4R1E6
x	-24	ILE	-	expression tag	UNP C4R1E6
x	-23	HIS	-	expression tag	UNP C4R1E6
x	-22	ASN	-	expression tag	UNP C4R1E6
x	-21	HIS	-	expression tag	UNP C4R1E6
x	-20	HIS	-	expression tag	UNP C4R1E6
x	-19	LYS	-	expression tag	UNP C4R1E6
x	-18	HIS	-	expression tag	UNP C4R1E6
x	-17	GLU	-	expression tag	UNP C4R1E6
x	-16	HIS	-	expression tag	UNP C4R1E6
x	-15	ALA	-	expression tag	UNP C4R1E6
x	-14	HIS	-	expression tag	UNP C4R1E6
x	-13	ALA	-	expression tag	UNP C4R1E6
x	-12	GLU	-	expression tag	UNP C4R1E6
x	-11	HIS	-	expression tag	UNP C4R1E6
x	-10	LEU	-	expression tag	UNP C4R1E6
x	-9	TYR	-	expression tag	UNP C4R1E6
x	-8	PHE	-	expression tag	UNP C4R1E6
x	-7	GLN	-	expression tag	UNP C4R1E6

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
x	-6	GLY	-	expression tag	UNP C4R1E6
x	-5	SER	-	expression tag	UNP C4R1E6
x	-4	SER	-	expression tag	UNP C4R1E6
x	-3	GLY	-	expression tag	UNP C4R1E6
x	-2	SER	-	expression tag	UNP C4R1E6
x	-1	SER	-	expression tag	UNP C4R1E6
x	0	GLY	-	expression tag	UNP C4R1E6

- Molecule 31 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
31	A	2	Total 2	Zn 2	0
31	B	1	Total 1	Zn 1	0
31	C	1	Total 1	Zn 1	0
31	I	2	Total 2	Zn 2	0
31	J	1	Total 1	Zn 1	0
31	L	1	Total 1	Zn 1	0
31	M	1	Total 1	Zn 1	0
31	V	1	Total 1	Zn 1	0
31	s	3	Total 3	Zn 3	0

- Molecule 32 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
32	A	1	Total 1	Mg 1	0

- Molecule 33 is S-ADENOSYL-L-HOMOCYSTEINE (CCD ID: SAH) (formula: $C_{14}H_{20}N_6O_5S$).
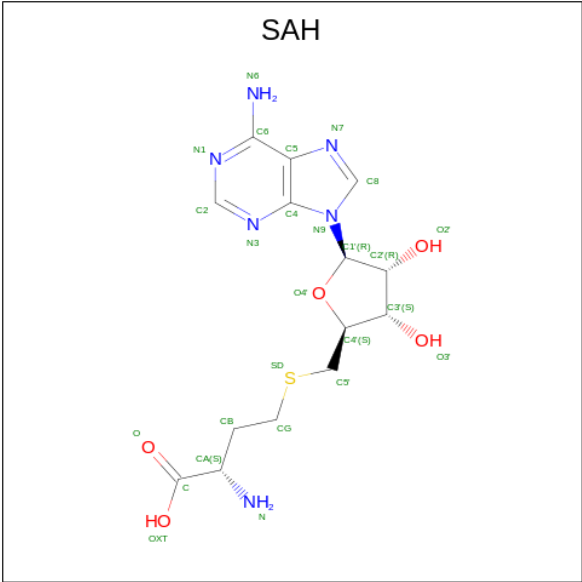
Mol	Chain	Residues	Atoms					AltConf
33	s	1	Total	C	N	O	S	0
			26	14	6	5	1	

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: DNA-directed RNA polymerase subunit
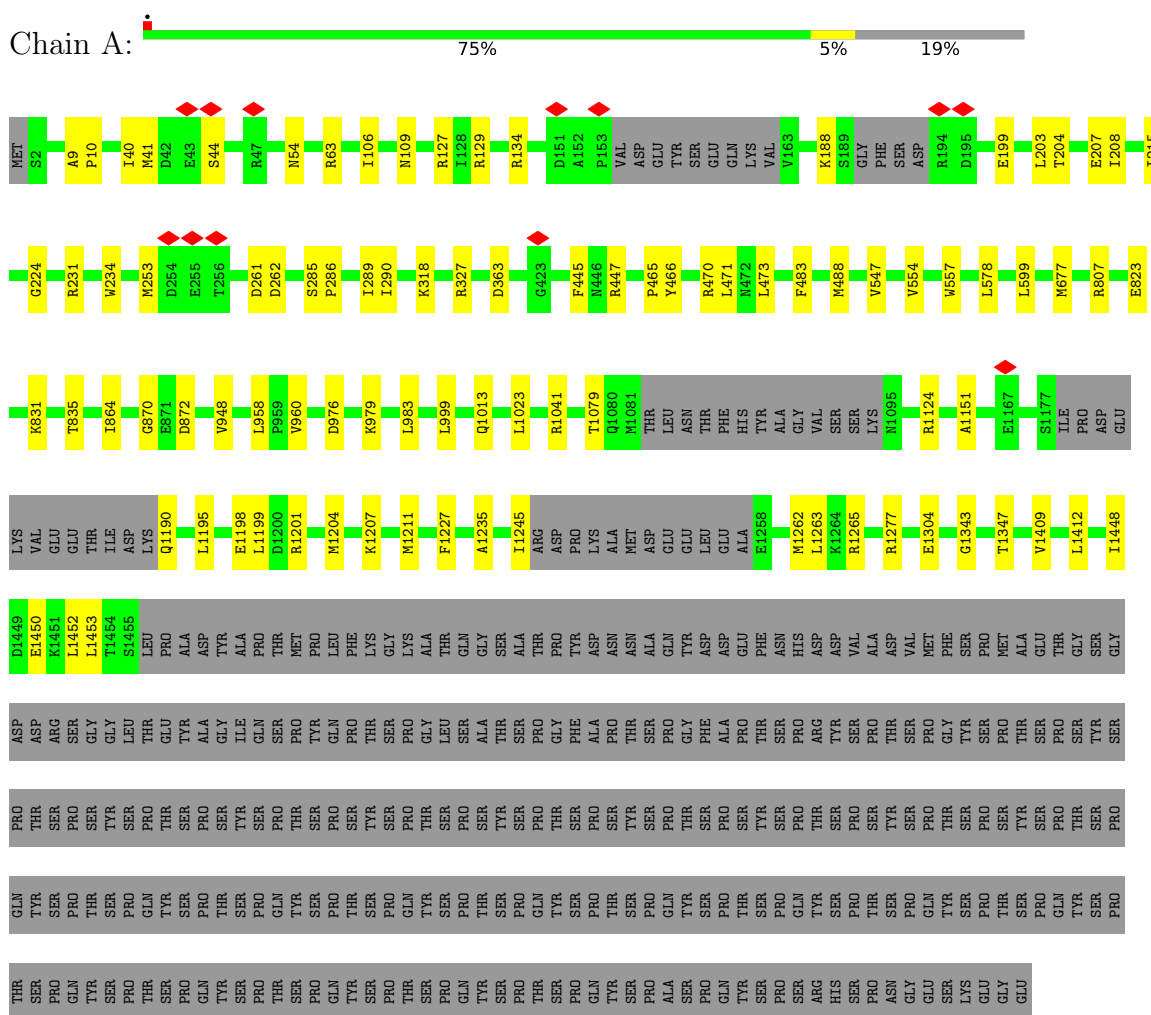
Chain A:

• Molecule 2: DNA-directed RNA polymerase subunit beta
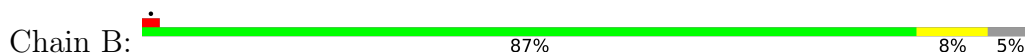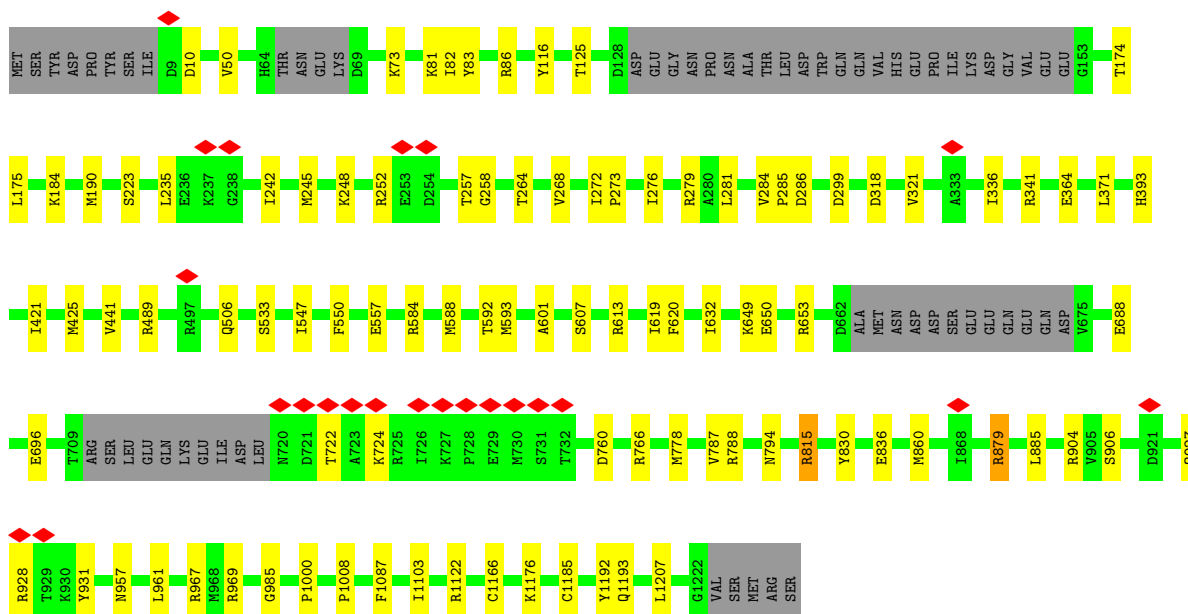
Chain B:

• Molecule 3: RNA polymerase II third largest subunit B44, part of central core

Chain C:

82%   13%
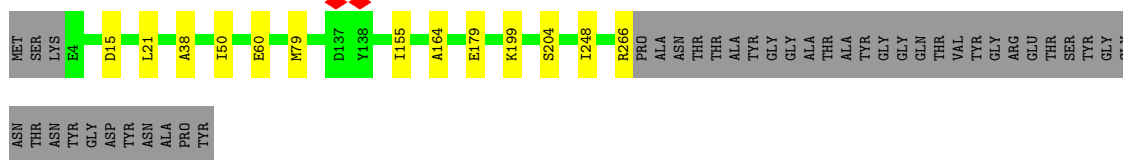
• Molecule 4: RNA polymerase II subunit B32

Chain D:

11%

89%   6%
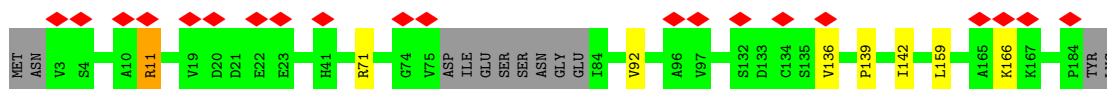
• Molecule 5: DNA-directed RNA polymerases I, II, and III subunit RPABC1

Chain E:

93%   7%
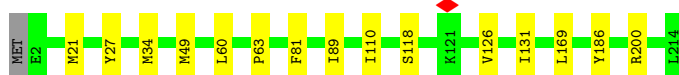
• Molecule 6: RNA polymerase subunit ABC23, common to RNA polymerases I, II, and III

Chain F:

52%   46%

ILE LYS ALA HIS ARG LYS ARG SER ASN LYS **E71** N104 D110 P131 D154 ASN
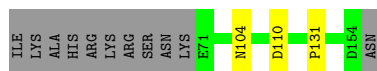
• Molecule 7: RNA polymerase II subunit

Chain G:

9%

91%   9%

M1 D6 N23 R27 L30 I54 V72 R75 V86 S92 N93 V94 S95 P96 I97 G98 V108 D117 P123 S124 N125 S126 P127 N133 I137 R144 R151 V154 N155 Y158 A159 I160 A170 I171
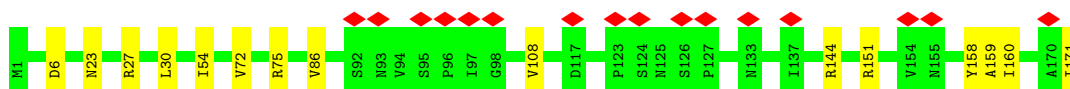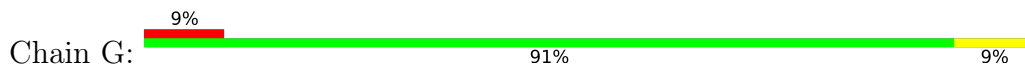
• Molecule 8: DNA-directed RNA polymerases I, II, and III subunit RPABC3

Chain H:

87%   5%   8%

MET SER S3 N17 S24 P48 L59 L65 ASP GLY GLU ASP GLU SER ALA ASN PHE SER K76 L121 M122 R145
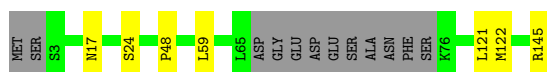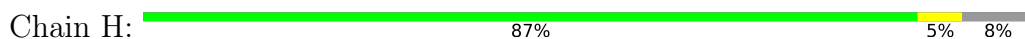
• Molecule 9: DNA-directed RNA polymerase subunit

Chain I:

83%   13%

MET ALA S3 L14 K17 K20 Q23 R24 L25 L26 Y27 D33 R45 H46 E47 N51 I52 I62 K73 F100 R111 D112 E113 SER GLU
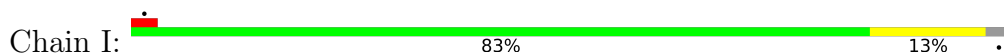
• Molecule 10: RNA polymerase subunit ABC10-beta, common to RNA polymerases I, II, and III

Chain J:

90%   7%

M1 L55 L65 E66 K67 LYS ASP PHE ASP SER
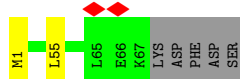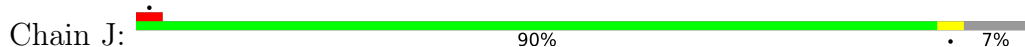
• Molecule 11: RNA polymerase II subunit B12.5

Chain K:

84%   12%

M1 D14 S25 R26 N29 L45 D55 H65 F68 E78 R82 I94 K99 T100 L101 D102 N113 PHE SER LEU ASN ASP
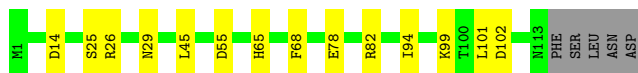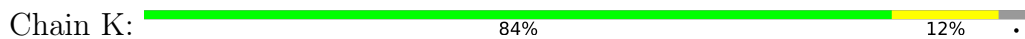
• Molecule 12: RNA polymerase subunit ABC10-alpha

Chain L:

61%   38%

MET SER ARG GLU GLY PHE VAL ALA PRO SER GLY THR ASP LEU ALA ALA ALA SER GLY VAL ALA PRO ASN LYS HIS TYR G28 R49 R72
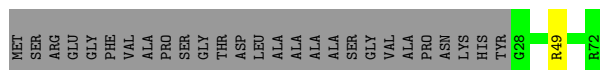
• Molecule 13: Transcription elongation factor 1 homolog

Chain M:
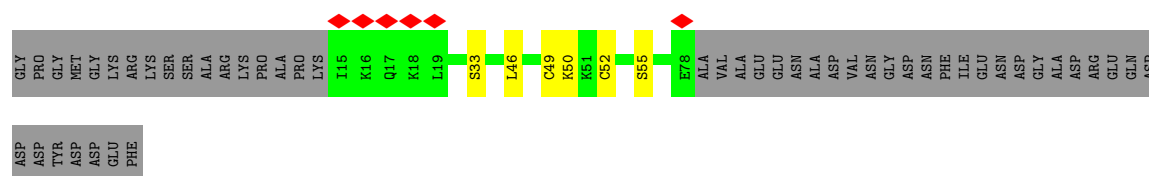
• Molecule 14: DNA (198-MER)

Chain N:
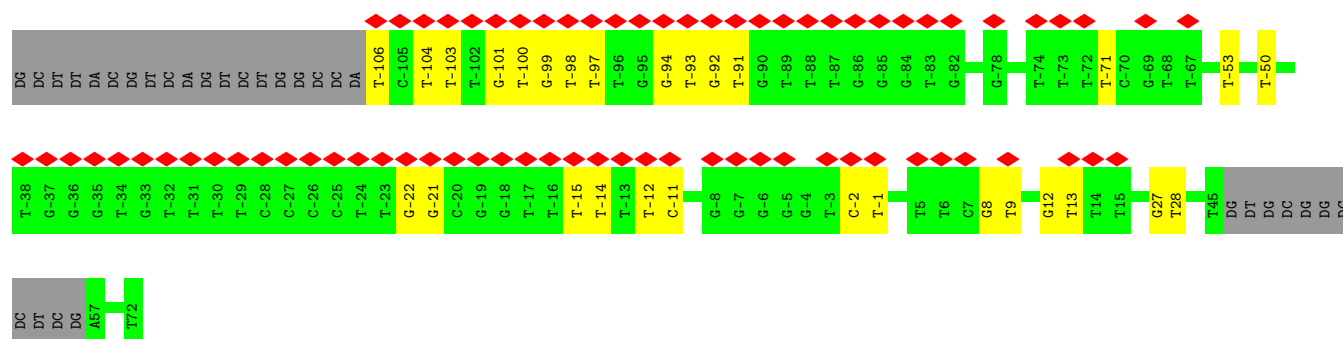
• Molecule 15: RNA (5'-R(P*GP*UP*CP*CP*UP*UP*UP*UP*GP*UP*GP*CP*GP*GP*CP*CP*UP*CP*G)-3')

Chain P:

• Molecule 16: DNA (198-MER)

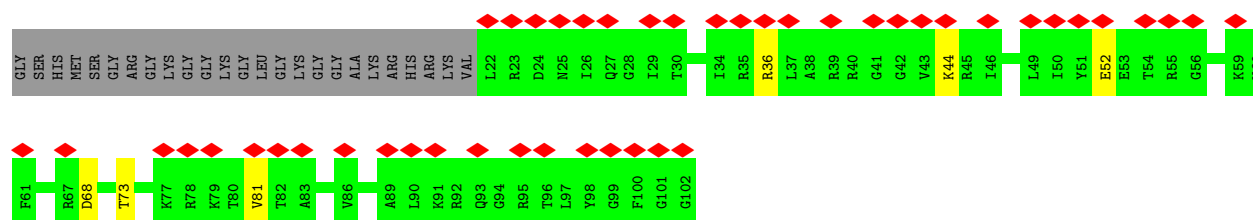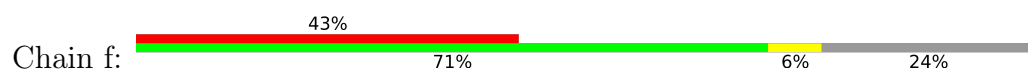Chain T:

• Molecule 17: Transcription elongation factor SPT4

Chain V:

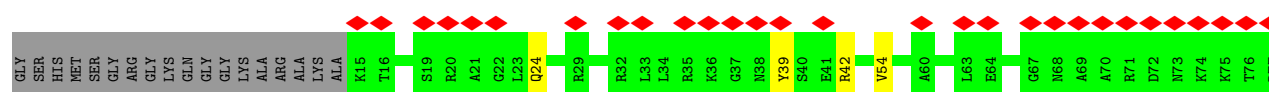• Molecule 18: Transcription elongation factor SPT5

Chain W:

14%

51%   7%   41%

• Molecule 19: Histone H3.3

Chain a:

24%

69%   6%   25%

S86 A87 A88 I89 G90 A91 L92 Q93 E94 A95 L100 D106 T107 N108 L109 H113 R128 R129 I130 R131 G132 E133 R134 A135

• Molecule 19: Histone H3.3

47%

Chain e:
60%　　　　6%　　　　35%

GLY SER HIS MET ALA ARG THR LYS GLN THR ALA ARG LYS SER THR GLY LYS ALA PRO ARG LYS GLN LEU ALA THR LYS ALA ALA ARG LYS SER ALA PRO SER THR GLY GLY VAL MET LYS PRO HIS ARG TYR ARG PRO G44 T45 V46 A47 L48 R49 E50 I51 R52 R53 Y54 Q55 K56

S57 L60 L61 I62 R63 K64 F67 Q68 R69 L70 V71 R72 E73 I74 A75 Q76 D77 F78 K79 T80 D81 L82 R83 F84 Q85 S86 A87 A91 L92 Q93 E94 A95 A98 Y99 L100 V101 G102 L103 F104 E105 D106 T107 N108 L109 C110 A111 I112 H113 A114 K115 R116 V117 T118 I119 M120 P121

K122 D123 I124 Q125 L126 A127 R128 R129 I130 R131 G132 E133 R134 ALA

• Molecule 20: Histone H4

25%

Chain b:
72%　　　　5%　　　　24%

GLY SER HIS MET SER GLY ARG GLY LYS GLY GLY LYS GLY LEU GLY LYS GLY GLY ALA LYS ARG HIS ARG LYS VAL L22 R23 D24 N25 R39 G42 V43 K44 L49 I50 Y51 E52 F61 I66 T82 A83 M84 D85 V86 V87 Y88 A89 L90 K91 R92 Q93 G94 R95 T96

L97 Y98 G99 F100 G101 G102

• Molecule 20: Histone H4

43%

Chain f:
71%　　　　6%　　　　24%

GLY SER HIS MET SER GLY ARG GLY LYS GLY GLY LYS GLY LEU GLY LYS GLY GLY ALA LYS ARG HIS ARG LYS VAL L22 R23 D24 N25 I26 Q27 G28 I29 T30 I34 R35 R36 L37 A38 R39 R40 G41 G42 V43 K44 R45 I46 L49 I50 Y51 E52 E53 T54 R55 G56 K59 V60

F61 R67 D68 T73 K77 R78 K79 T80 V81 T82 A83 V86 A89 L90 K91 R92 Q93 G94 R95 T96 L97 Y98 G99 F100 G101 G102

• Molecule 21: Histone H2A type 1-B/E

45%

Chain c:
72%　　　　6%　　　　22%

GLY SER HIS MET SER GLY ARG GLY LYS GLN GLY GLY LYS ALA ARG ALA LYS ALA K15 T16 S19 R20 A21 G22 L23 Q24 R29 R32 L33 L34 R35 K36 G37 N38 Y39 S40 E41 R42 V54 A60 L63 E64 G67 N68 A69 A70 R71 D72 N73 K74 K75 T76 R77

I78 I79 P80 R81 H82 L83 Q84 L85 A86 I87 R88 N89 D90 E91 E92 L93 N94 K95 L96 L97 G98 R99 V100 T101 I102 G106 V107 L108 P109 N110 I111 Q112 A113 V114 L115 L116 P117 K118 LYS THR GLU SER HIS HIS LYS ALA LYS GLY LYS

• Molecule 21: Histone H2A type 1-B/E

Chain g:

GLY SER HIS MET SER GLY ARG GLY LYS GLN GLY GLY LYS ALA ARG ALA K13 A14 K15 T16 R17 S18 S19 R20 A21 G22 R32 L33 L34 R35 K36 G37 N38 Y39 S40 E41 R42 V43 G44 A45 A53 V54 L55 E56 Y57 A60 E61 I62 L63 E64 L65 A66 G67 N68 A69 A70 R71

D72 P80 R81 H82 L83 Q84 L85 A86 I87 R88 N89 D90 E91 E92 L93 N94 K95 L96 L97 G98 R99 V100 T101 I102 A103 Q104 G105 G106 N110 I111 Q112 A113 V114 L115 L116 P117 K118 LYS THR GLU SER HIS HIS LYS ALA LYS GLY LYS

• Molecule 22: Histone H2B type 1-J

Chain d:

GLY SER HIS MET PRO GLU GLU PRO ALA LYS SER ALA PRO ALA PRO LYS LYS GLY SER LYS LYS ALA VAL THR LYS ALA GLN LYS LYS ASP GLY LYS LYS ARG LYS ARG S32 R33 K34 E35 S36 Y37 S38 I39 Y40 V41 L45 K46 Q47 V48 H49 P50 D51 T52 G53 I54 S55 S56 K57 A58

M59 G60 I61 M62 F65 V66 N67 D68 I69 F70 E71 R72 I73 A74 G75 E76 A77 S78 R79 L80 A81 H82 Y83 N84 K85 T88 I89 T90 S91 Q95 T96 A97 V98 R99 L100 L101 G104 E105 L106 A107 K108 H109 A110 V111 S112 E113 G114 T115 K116 A117 V118 T119 K120 Y121 T122 S123

A124 LYS

• Molecule 22: Histone H2B type 1-J

Chain h:

GLY SER HIS MET PRO GLU GLU PRO ALA LYS SER ALA PRO ALA PRO LYS LYS GLY SER LYS LYS ALA VAL THR LYS ALA GLN LYS LYS ASP GLY LYS LYS ARG LYS ARG S32 R33 K34 E35 Y40 V41 Y42 K43 V44 L45 K46 Q47 V48 H49 P50 D51 A58 I61 S64 D68

E71 R72 I73 A74 G75 R79 H82 Y83 N84 K85 R86 S87 T90 A97 V98 R99 L100 L101 L102 P103 G104 E105 L106 A107 K108 H109 A110 V111 S112 E113 G114 T115 K116 A117 V118 T119 K120 Y121 T122 S123 A124 K125

• Molecule 23: Transcription elongation factor Spt6

Chain m:

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

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

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

• Molecule 24: Protein that interacts with Spt6p and copurifies with Spt5p and RNA polymerase II

Chain n:

10%

29% 5% 67%

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

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

VAL GLU ASP GLU ALA ALA ARG ARG THR ARG ARG LEU PHE GLU GLU GLU LYS LEU ASP ALA ILE LYS ARG LYS PRO ASN ARG LYS LYS ASN ASP VAL ASP **L152 E153 Q154 M155 Q156 D157** L163 **N177 I178 E179 Q180 G181 K182 P183 A184 I185 F186** L190 V194 L199

S206 I207 N210 R211 L212 L213 V216 R217 L220 D225 A226 S227 Q232 K235 V236 L237 I241 K242 S243 I246 K247 R252 K258 V259 M260 Y263 K267 R268 V269 E270 P271 N272 L273 K274 R275 I281 S282 D283 W284 P287 I288 M289 G290 ALA SER ASP

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

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

GLN

• Molecule 25: Component of the Paf1p complex

Chain q:

20%

79% 6% 14%

MET LYS ASP HIS LEU ILE HIS ASN HIS HIS LYS HIS GLU HIS ALA HIS GLU HIS ASP TYR LYS ASP ASP ASP LYS GLU HIS LEU TYR PHE GLN GLY SER SER GLY SER SER GLY **M1 S2 D7 Y8 Y9 L10 S11 A12 E15 D16 K17 R18 A19 E20 L21 V22 T23 L24**

Q25 L26 T27 I28 P29 L30 K31 S32 G33 D34 E35 V36 V37 T38 I39 D40 F41 N42 E43 D44 V45 D46 V47 S48 Q49 L50 C51 V52 L53 L54 E55 S56 E57 N58 A59 R60 P61 D62 L63 W64 L65 K69 V70 F71 V72 S73 K74 G75 N76 I77 A78 G79 S80 Q81 E82 I83 I84 R85 K86

A87 L88 Q89 S90 N91 V92 I93 L94 D95 S96 S97 A98 S99 V100 T101 S102 L103 F104 H105 N106 F107 S108 F109 W110 L111 M114 E115 S118 T119 N120 S121 R122 E123 D124 Q125 F126 L127 E128 Y129 N132 S133 L134 Q135 A136 S137 N138 S139 L140 D141 S142 G143 L144 I145 L146 N147 G148 I149

Y155 A156 K157 S158 R159 R160 Y161 D162 E163 A164 L165 K166 E167 F168 D169 N170 L171 L172 K173 K174 S176 T177 G184 K185 L189 R192 Q193 K194 Y195 S196 Q197 E200 L201 Y202 Q203 L206 N209 P210 D215 P216 R217 L227 N228 N229 K230 Q231 L232 Q235

N239 K242 N250 I253 E266 S267 K268 D269 D270 D271 A275 K289 E290 D291 A292 L297 L320 K323 K357 D361 S362 Q363 N364 L390 E396 N397 Q398 D399 L409 Q435 E436 R451 N459 D463 M466 K467 A468 N469 D470 G473

- Molecule 26: RNAPII-associated chromatin remodeling Paf1 complex subunit

Chain r:

30%

43%　6%　51%

- Molecule 27: Histone-lysine N-methyltransferase, H3 lysine-36 specific

Chain s:

39%

55%　5%　41%

• Molecule 28: Leo1

Chain u:

23%

36%   5%   59%

W173 E174 D175 G176 T177 Y178 S179 L180 G183 S184 E185 M189 F190 T191 T192 N193 T194 D195 D196 L199 V200 H203 N204 E205 E206 G207 I208 L209 M210 T211 L215 S216 V219 K220 L221 A224 S225 F226 Q227 S228 T229 A237 L238 S239 A240 K241 Q242 K243 K244 E245 S246

Y247 A248 V252 T253 K254 E255 E259 R260 Q261 R262 ARG LEU GLU SER GLN GLU ASN GLU ARG TYR ARG LEU GLU ARG ARG LYS GLN ALA GLU GLU GLU GLU ASP TYR ASP SER TYR ALA VAL SER THR SER ARG SER ARG PRO SER ARG ALA SER GLN MET TYR ASN ALA ALA ASP

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

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

• Molecule 29: RNAP II-associated protein

49%

Chain v:

80%   8%   12%

GLY SER ALA MET THR SER SER LYS SER R7 D19 P24 L30 I34 E35 Q40 R60 N64 G69 L70 D71 Y74 L75 I80 I81 E82 N83 E84 K85 G88 K89 L90 F91 S92 K95 N96 L97 A98 I99 E100 N101 L102 H103 P104 D105 D106 R107 L108

L109 L110 V111 D112 P113 ASN LYS SER ALA THR LEU ASN GLU GLU S123 Q132 S135 D136 G137 GLU LYS ILE ASN LEU GLN ASN PHE THR ASN LYS ARG LYS HIS GLN ASP MET GLU D156 T157 N158 Q162 R177 N178 K179 N180 L185 V195 P202 D203 T204 S205 T206 F207

D208 Q209 V210 F211 H212 S213 V217 G218 S219 A220 S221 L222 S223 K224 D225 R226 P227 L228 N229 E230 Q231 L232 G233 Q234 VAL SER GLU THR ASP SER THR SER V243 N244 A245 S246 I247 F252 K253 P254 I255 E256 I257 N258 P259 H260 N261 K262 W263 I264 S265 L266 Y267 T270 D271 K272 L273

S274 A275 E276 S277 F278 R279 K280 S281 F282 N283 S284 I285 K286 D287 D288 N289 I290 V291 N292 R293 H294 V295 I296 Y297 D298 H299 I300 K301 D302 F303 D304 Q305 M306 F307 R308 G309 H310 K311 K312 L313 F314 E315 D316 F317 A318 I319 D322 D323 I324 P332 I333 V334 G335 R336 L337 E338 L339 K340

K341 K342 R343 I344 V345 P346 G347 L348 V349 D350 M351 V352 N353 R354 T355 N356 Y357 A358 H359 I360 R361 M362 D363 L364 R365 N366 P367 S368 T369 Q370 E371 T372 A373 I374 R375 D376 S377 R378 R379 E380 Q381 Y382 D383 P384 V385 N386 Y387 S388 S389 I390 GLN GLU GLU

• Molecule 30: Constituent of Paf1 complex with RNA polymerase II, Paf1p, Hpr1p, Ctr9, Leo1, Rtf1 and Ccr4p

7%

Chain x:

49%   •   48%

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

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

SER GLU LEU ILE SER TRP LEU LYS GLY GLU ILE THR SER SER ALA PHE ILE LYS GLY GLU LYS VAL GLY ILE PHE ASN LEU LYS VAL ILE THR GLU GLU ASN GLY ASP ASN GLY LYS LYS ASN ASN GLY LYS ARG LEU SER D135 I150 K154 R157 G158 L159 K160 P161 K162 K179 PRO ALA

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	10768	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{Å}^2)$	59.1	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.070	Depositor
Minimum map value	-0.026	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.003	Depositor
Recommended contour level	0.015	Depositor
Map size (Å)	531.0, 531.0, 531.0	wwPDB
Map dimensions	360, 360, 360	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.475, 1.475, 1.475	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$|Z|$ >5	RMSZ	#$|Z|$ >5
1	A	0.23	0/11267	0.50	0/15222
2	B	0.23	0/9464	0.51	0/12763
3	C	0.22	0/2139	0.46	0/2895
4	D	0.17	0/1361	0.44	0/1837
5	E	0.22	0/1773	0.54	0/2385
6	F	0.21	0/687	0.48	0/931
7	G	0.17	0/1354	0.39	0/1837
8	H	0.22	0/1070	0.43	0/1444
9	I	0.15	0/934	0.41	0/1257
10	J	0.22	0/563	0.52	0/753
11	K	0.22	0/953	0.49	0/1291
12	L	0.23	0/365	0.58	0/484
13	M	0.17	0/513	0.37	0/693
14	N	0.28	0/3837	0.60	0/5930
15	P	0.26	0/441	0.63	0/684
16	T	0.25	0/4142	0.53	0/6378
17	V	0.17	0/840	0.47	0/1140
18	W	0.20	0/4319	0.51	0/5838
19	a	0.24	0/853	0.63	0/1144
19	e	0.26	0/747	0.65	0/1001
20	b	0.26	0/653	0.67	0/873
20	f	0.27	0/653	0.67	0/873
21	c	0.23	0/815	0.60	0/1100
21	g	0.26	0/829	0.62	0/1118
22	d	0.24	0/736	0.61	0/990
22	h	0.27	0/746	0.60	0/1001
23	m	0.20	0/9847	0.46	0/13321
24	n	0.19	0/1132	0.45	0/1526
25	q	0.18	0/7689	0.40	0/10368
26	r	0.19	0/2169	0.43	0/2901
27	s	0.33	0/3473	0.62	0/4676
28	u	0.17	0/1554	0.38	0/2102

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$\|Z\|$ >5	RMSZ	#$\|Z\|$ >5
29	v	0.18	0/2944	0.44	0/3973
30	x	0.16	0/1716	0.39	0/2310
All	All	0.22	0/82578	0.50	0/113039

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2   Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	11064	0	11090	62	0
2	B	9284	0	9282	63	0
3	C	2098	0	2057	10	0
4	D	1349	0	1345	5	0
5	E	1741	0	1754	10	0
6	F	677	0	693	3	0
7	G	1325	0	1342	9	0
8	H	1053	0	1050	4	0
9	I	917	0	864	10	0
10	J	554	0	573	1	0
11	K	932	0	944	11	0
12	L	359	0	358	1	0
13	M	505	0	495	3	0
14	N	3443	0	1927	22	0
15	P	398	0	203	6	0
16	T	3671	0	1976	20	0
17	V	824	0	795	11	0
18	W	4250	0	4296	52	0
19	a	841	0	883	7	0
19	e	739	0	778	8	0
20	b	646	0	687	5	0
20	f	646	0	687	5	0
21	c	805	0	861	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
21	g	819	0	879	9	0
22	d	725	0	745	8	0
22	h	735	0	758	9	0
23	m	9653	0	9500	63	0
24	n	1115	0	1186	15	0
25	q	7552	0	7545	43	0
26	r	2139	0	2155	19	0
27	s	3419	0	3351	20	0
28	u	1522	0	1492	19	0
29	v	2878	0	2873	25	0
30	x	1682	0	1731	7	0
31	A	2	0	0	0	0
31	B	1	0	0	0	0
31	C	1	0	0	0	0
31	I	2	0	0	0	0
31	J	1	0	0	0	0
31	L	1	0	0	0	0
31	M	1	0	0	0	0
31	V	1	0	0	0	0
31	s	3	0	0	0	0
32	A	1	0	0	0	0
33	s	26	0	19	1	0
All	All	80400	0	77174	456	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 3.

The worst 5 of 456 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)
1:A:445:PHE:CE2	1:A:471:LEU:HD21	2.24	0.72
14:N:27:DG:H2'	14:N:28:DT:H71	1.74	0.69
18:W:461:LEU:HD13	23:m:278:THR:HA	1.74	0.69
18:W:444:LEU:HG	23:m:284:PHE:CE1	2.28	0.69
18:W:218:ILE:CD1	24:n:289:MET:HE1	2.23	0.68

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

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	1392/1743 (80%)	1355 (97%)	36 (3%)	1 (0%)	48	83
2	B	1154/1227 (94%)	1127 (98%)	27 (2%)	0	100	100
3	C	261/304 (86%)	259 (99%)	2 (1%)	0	100	100
4	D	170/186 (91%)	168 (99%)	2 (1%)	0	100	100
5	E	211/214 (99%)	207 (98%)	4 (2%)	0	100	100
6	F	82/155 (53%)	79 (96%)	3 (4%)	0	100	100
7	G	169/171 (99%)	166 (98%)	3 (2%)	0	100	100
8	H	129/145 (89%)	125 (97%)	4 (3%)	0	100	100
9	I	109/115 (95%)	105 (96%)	4 (4%)	0	100	100
10	J	65/72 (90%)	65 (100%)	0	0	100	100
11	K	111/118 (94%)	109 (98%)	2 (2%)	0	100	100
12	L	43/72 (60%)	41 (95%)	2 (5%)	0	100	100
13	M	62/113 (55%)	61 (98%)	1 (2%)	0	100	100
17	V	104/108 (96%)	102 (98%)	2 (2%)	0	100	100
18	W	529/911 (58%)	506 (96%)	23 (4%)	0	100	100
19	a	102/139 (73%)	100 (98%)	2 (2%)	0	100	100
19	e	89/139 (64%)	88 (99%)	1 (1%)	0	100	100
20	b	79/106 (74%)	76 (96%)	3 (4%)	0	100	100
20	f	79/106 (74%)	76 (96%)	3 (4%)	0	100	100
21	c	102/133 (77%)	100 (98%)	2 (2%)	0	100	100
21	g	104/133 (78%)	101 (97%)	3 (3%)	0	100	100
22	d	91/129 (70%)	88 (97%)	3 (3%)	0	100	100
22	h	92/129 (71%)	90 (98%)	2 (2%)	0	100	100
23	m	1170/1503 (78%)	1152 (98%)	18 (2%)	0	100	100
24	n	137/417 (33%)	136 (99%)	1 (1%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
25	q	928/1084 (86%)	923 (100%)	5 (0%)	0	100	100
26	r	260/544 (48%)	254 (98%)	6 (2%)	0	100	100
27	s	429/725 (59%)	417 (97%)	12 (3%)	0	100	100
28	u	186/459 (40%)	186 (100%)	0	0	100	100
29	v	341/396 (86%)	330 (97%)	11 (3%)	0	100	100
30	x	201/395 (51%)	200 (100%)	1 (0%)	0	100	100
All	All	8981/12191 (74%)	8792 (98%)	188 (2%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	960	VAL

5.3.2   Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	1219/1528 (80%)	1219 (100%)	0	100	100
2	B	1018/1077 (94%)	1014 (100%)	4 (0%)	89	91
3	C	236/264 (89%)	236 (100%)	0	100	100
4	D	149/160 (93%)	148 (99%)	1 (1%)	81	87
5	E	196/197 (100%)	196 (100%)	0	100	100
6	F	75/137 (55%)	75 (100%)	0	100	100
7	G	148/148 (100%)	148 (100%)	0	100	100
8	H	120/130 (92%)	120 (100%)	0	100	100
9	I	106/109 (97%)	106 (100%)	0	100	100
10	J	61/66 (92%)	61 (100%)	0	100	100
11	K	104/109 (95%)	104 (100%)	0	100	100
12	L	38/56 (68%)	38 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
13	M	61/99 (62%)	61 (100%)	0	100	100
17	V	90/92 (98%)	90 (100%)	0	100	100
18	W	482/796 (61%)	482 (100%)	0	100	100
19	a	87/112 (78%)	87 (100%)	0	100	100
19	e	77/112 (69%)	77 (100%)	0	100	100
20	b	66/81 (82%)	66 (100%)	0	100	100
20	f	66/81 (82%)	66 (100%)	0	100	100
21	c	83/102 (81%)	83 (100%)	0	100	100
21	g	84/102 (82%)	84 (100%)	0	100	100
22	d	79/107 (74%)	79 (100%)	0	100	100
22	h	80/107 (75%)	79 (99%)	1 (1%)	65	77
23	m	1079/1354 (80%)	1078 (100%)	1 (0%)	92	94
24	n	125/361 (35%)	125 (100%)	0	100	100
25	q	824/962 (86%)	824 (100%)	0	100	100
26	r	239/485 (49%)	239 (100%)	0	100	100
27	s	380/649 (59%)	380 (100%)	0	100	100
28	u	173/406 (43%)	173 (100%)	0	100	100
29	v	325/369 (88%)	325 (100%)	0	100	100
30	x	190/354 (54%)	190 (100%)	0	100	100
All	All	8060/10712 (75%)	8053 (100%)	7 (0%)	92	94

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	904	ARG
4	D	11	ARG
23	m	770	PHE
22	h	42	TYR
2	B	879	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 100 such sidechains are listed below:

Mol	Chain	Res	Type
23	m	819	ASN

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Mol	Chain	Res	Type
25	q	147	ASN
30	x	251	GLN
23	m	886	HIS
23	m	1338	ASN

5.3.3 RNA (i)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
15	P	18/19 (94%)	8 (44%)	1 (5%)

5 of 8 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
15	P	-6	U
15	P	-5	C
15	P	-4	C
15	P	-3	U
15	P	-2	U

All (1) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
15	P	-4	C

5.4 Non-standard residues in protein, DNA, RNA chains (i)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 15 ligands modelled in this entry, 14 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	$\#|Z| > 2$
33	SAH	s	1904	-	24,28,28	0.83	1 (4%)	25,40,40	0.74	0

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
33	SAH	s	1904	-	-	2/11/31/31	0/3/3/3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
33	s	1904	SAH	C8-N7	-2.44	1.30	1.34

There are no bond angle outliers.

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
33	s	1904	SAH	O-C-CA-N
33	s	1904	SAH	OXT-C-CA-N

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
33	s	1904	SAH	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be

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

Ligand SAH s 1904

Bond lengths   Bond angles

Torsions   Rings
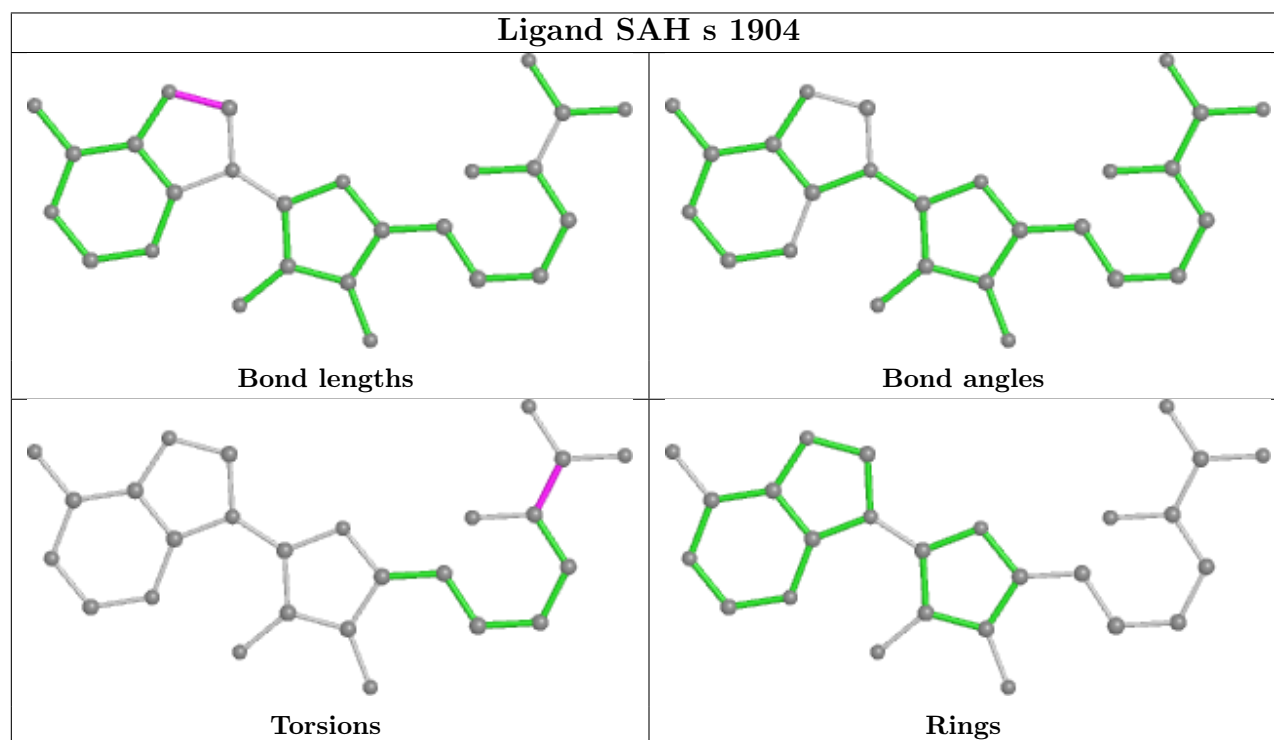
5.7 Other polymers ⓘ

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-66106. These allow visual inspection of the internal detail of the map and identification of artifacts.

Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1   Orthogonal projections ⓘ
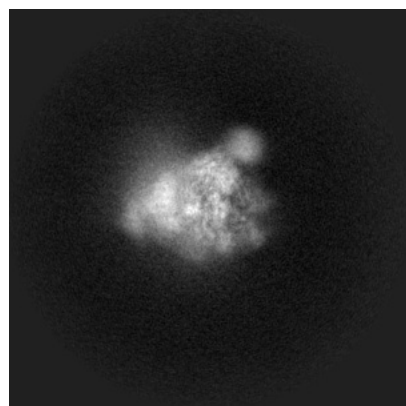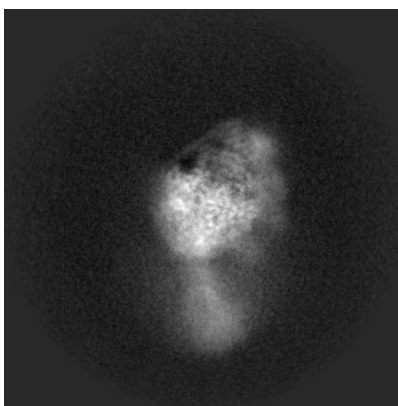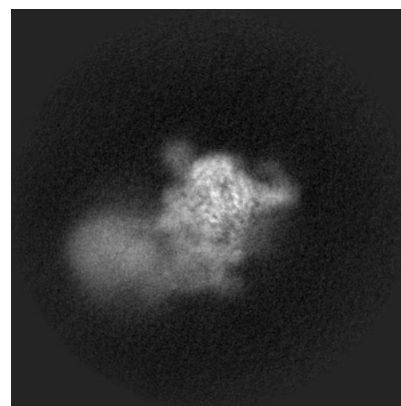
6.1.1   Primary map

X   Y   Z

6.1.2   Raw map

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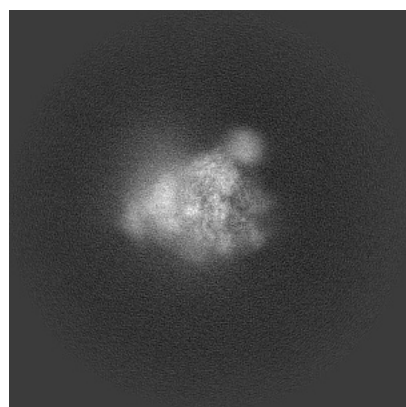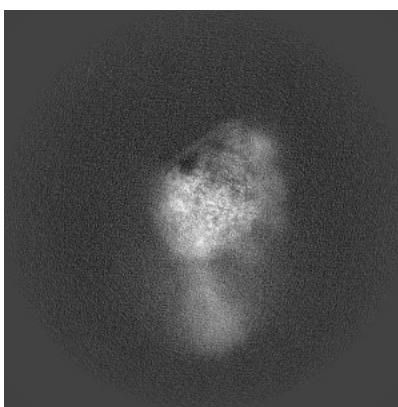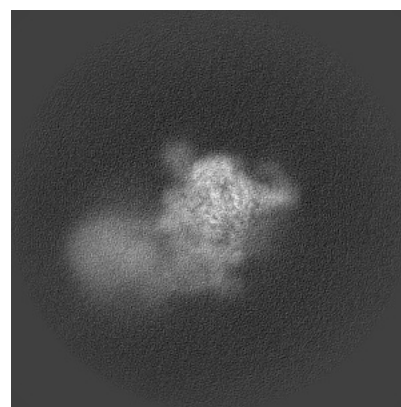
The images above show the map projected in three orthogonal directions.

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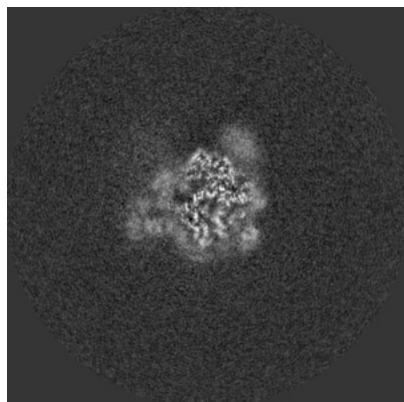
6.2.1 Primary map
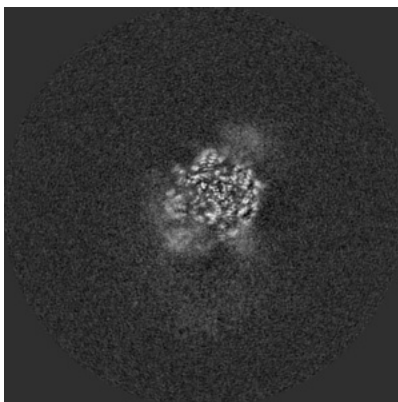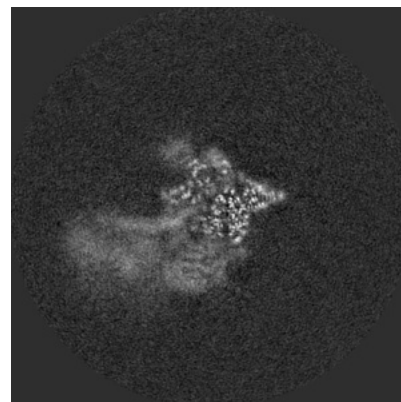
X Index: 180   Y Index: 180   Z Index: 180

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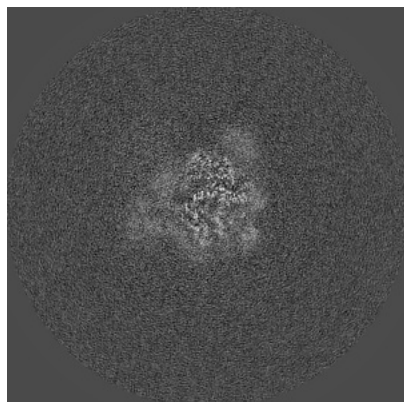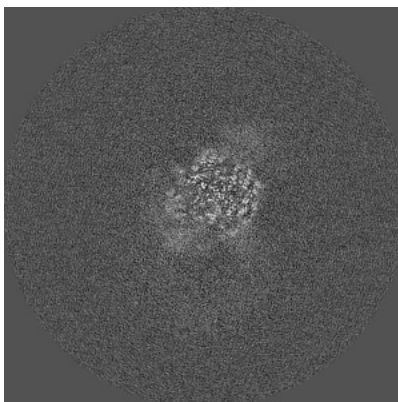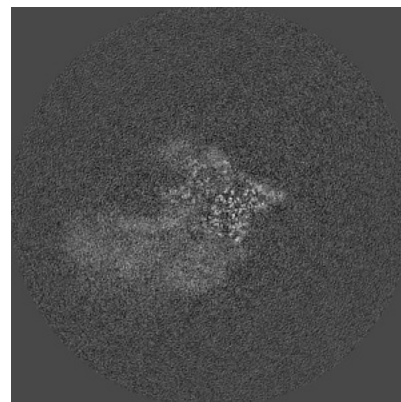
X Index: 180   Y Index: 180   Z Index: 180

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

6.3   Largest variance slices ⓘ

6.3.1   Primary map
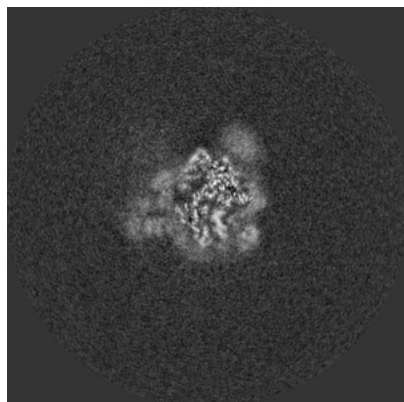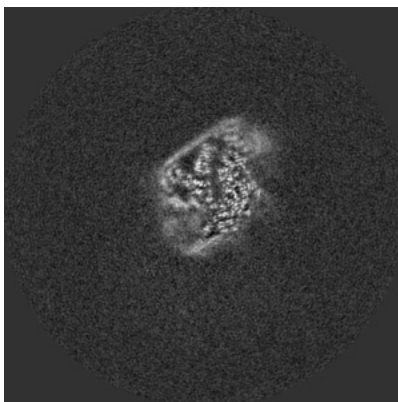
| X Index: 181 | Y Index: 192 | Z Index: 178 |
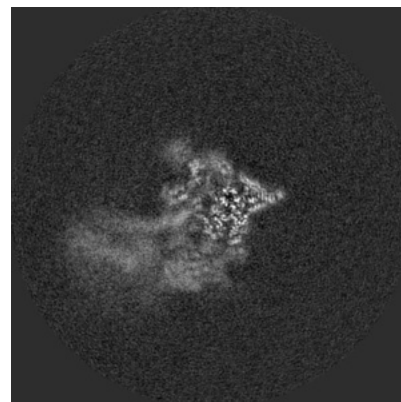
6.3.2   Raw map
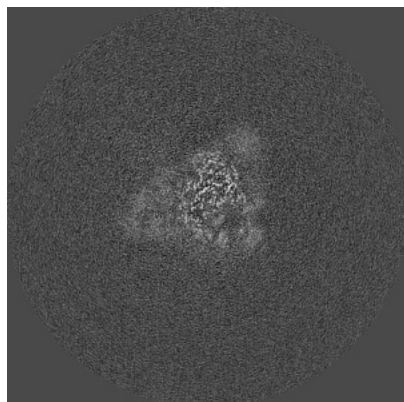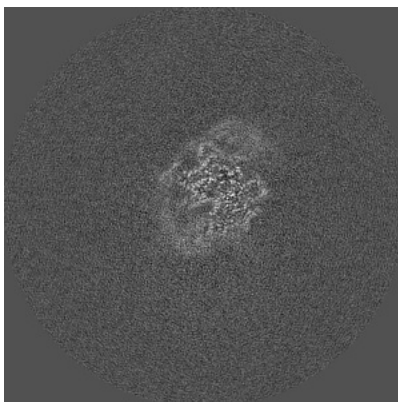
| X Index: 187 | Y Index: 186 | Z Index: 178 |
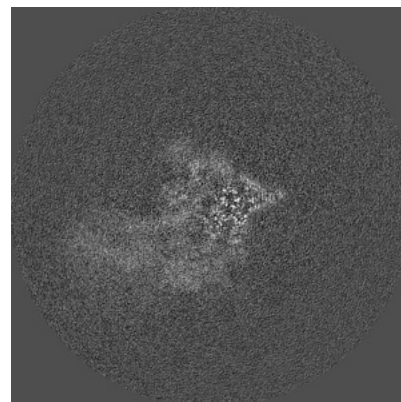
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map
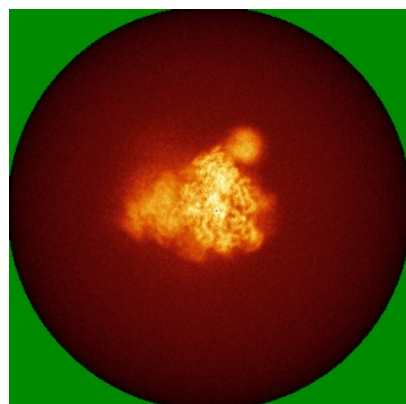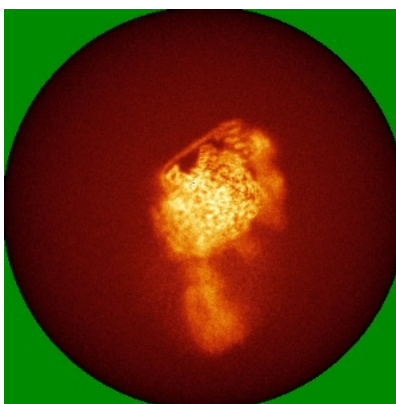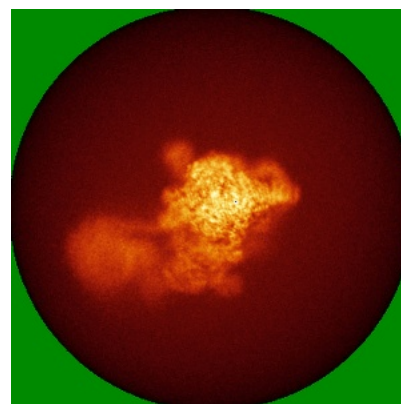
| X | Y | Z |

6.4.2 Raw map

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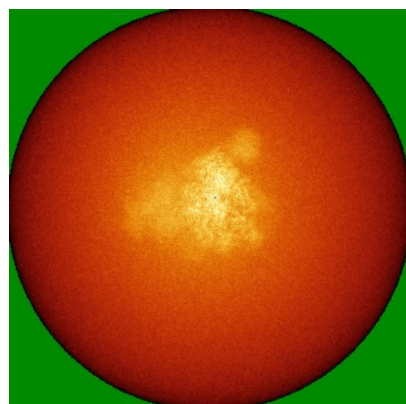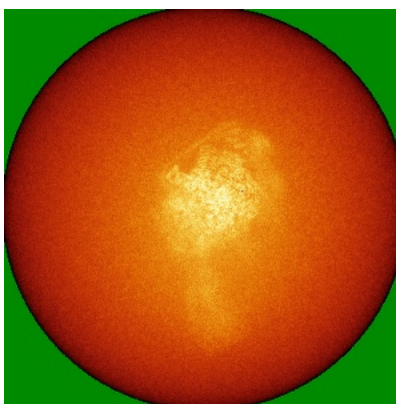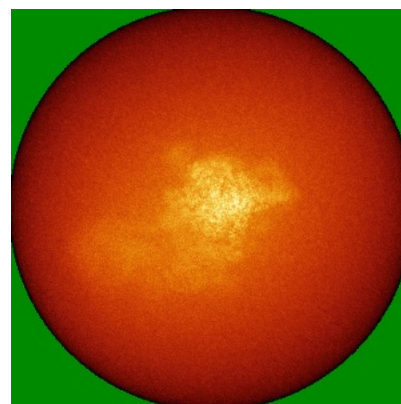
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5   Orthogonal surface views ⓘ

6.5.1   Primary map

| X | Y | Z |
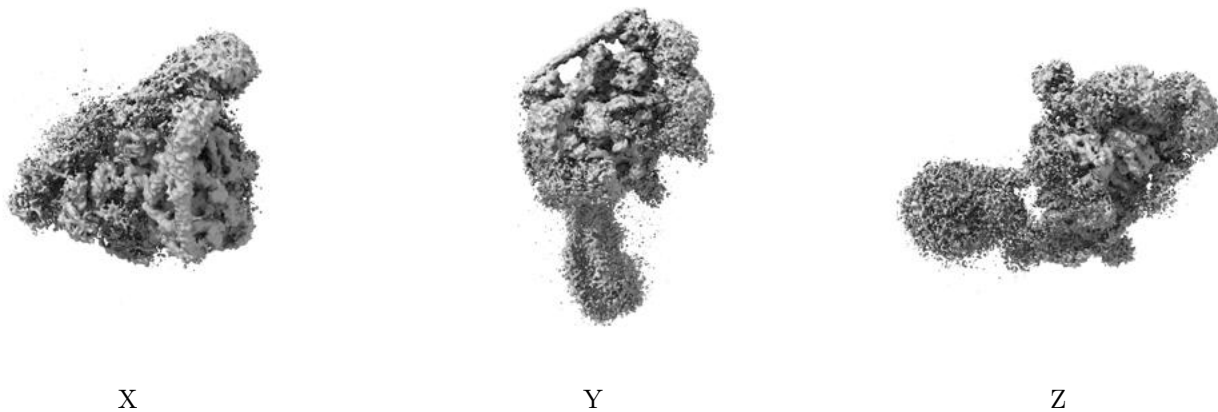
The images above show the 3D surface view of the map at the recommended contour level 0.015. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2   Raw map

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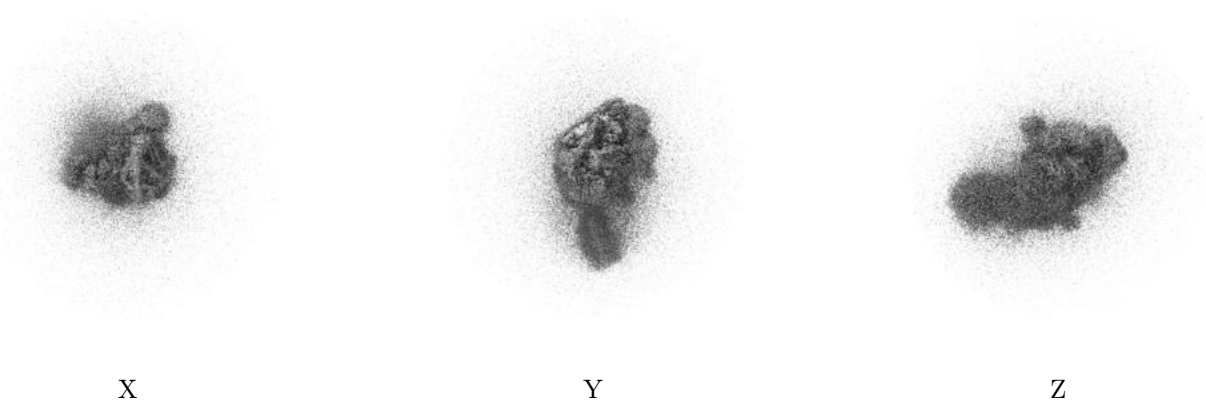
These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

6.6   Mask visualisation ⓘ

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

7   Map analysis ⓘ

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

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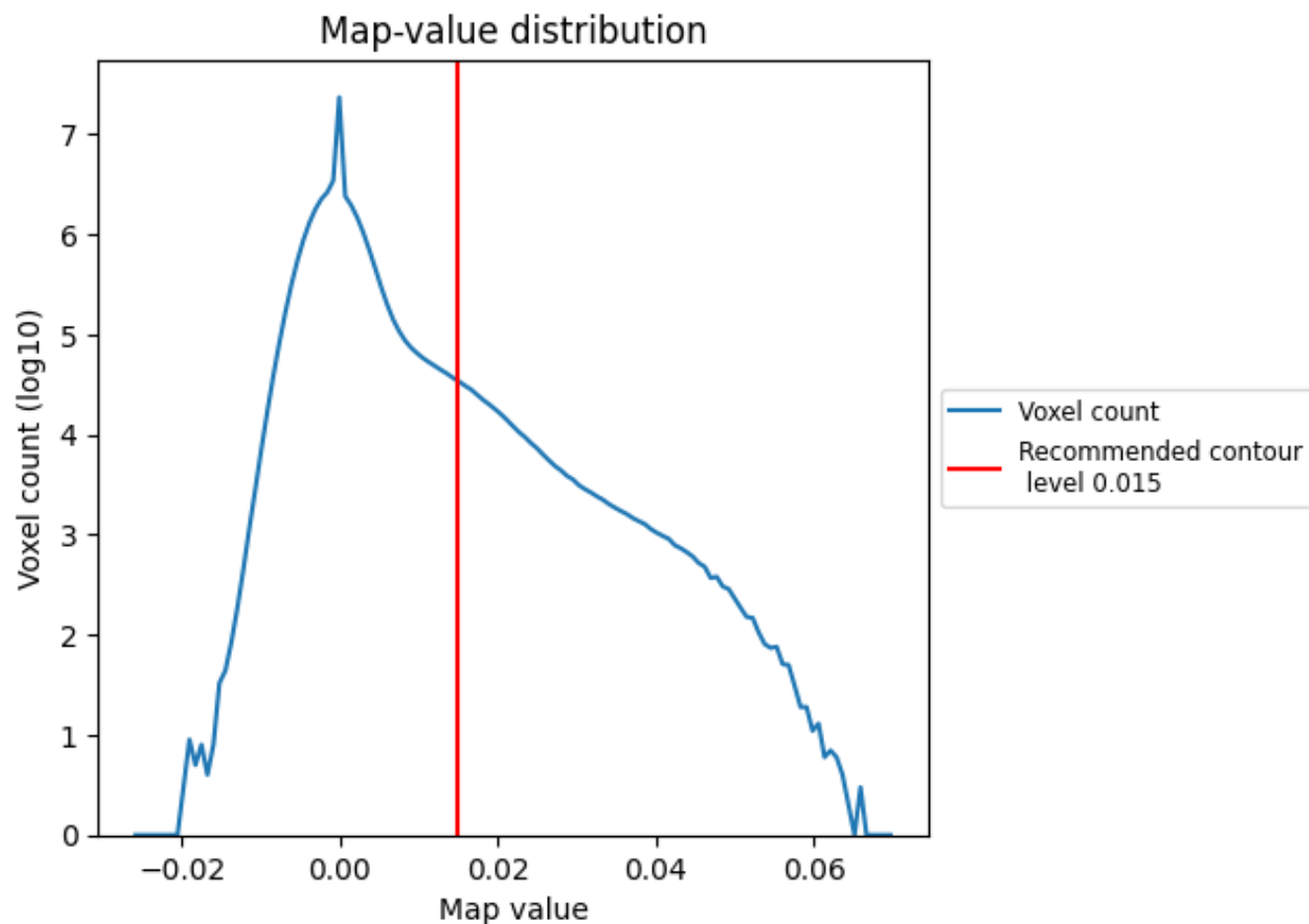
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2 Volume estimate ⓘ
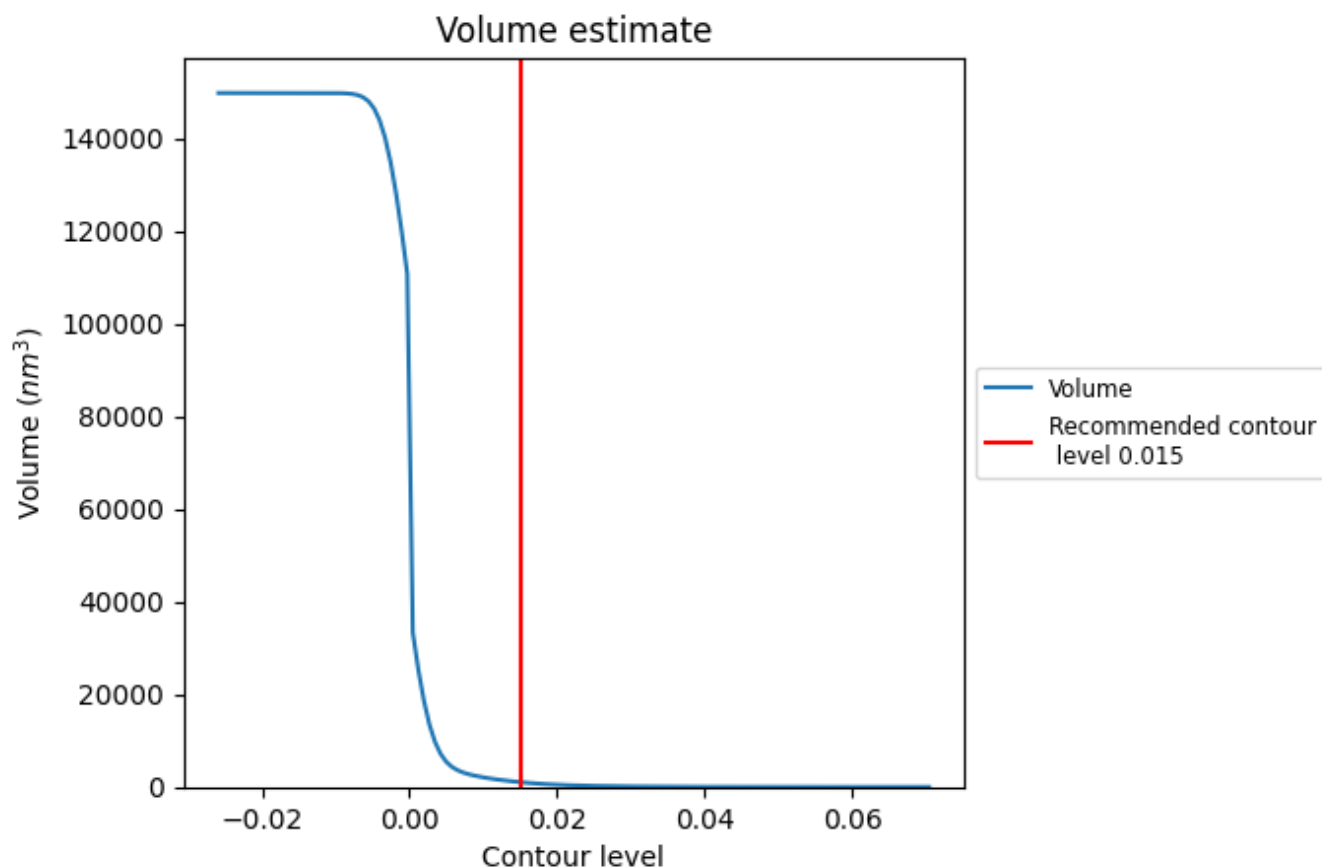
The volume at the recommended contour level is 1042 nm^3; this corresponds to an approximate mass of 941 kDa.

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 ⓘ
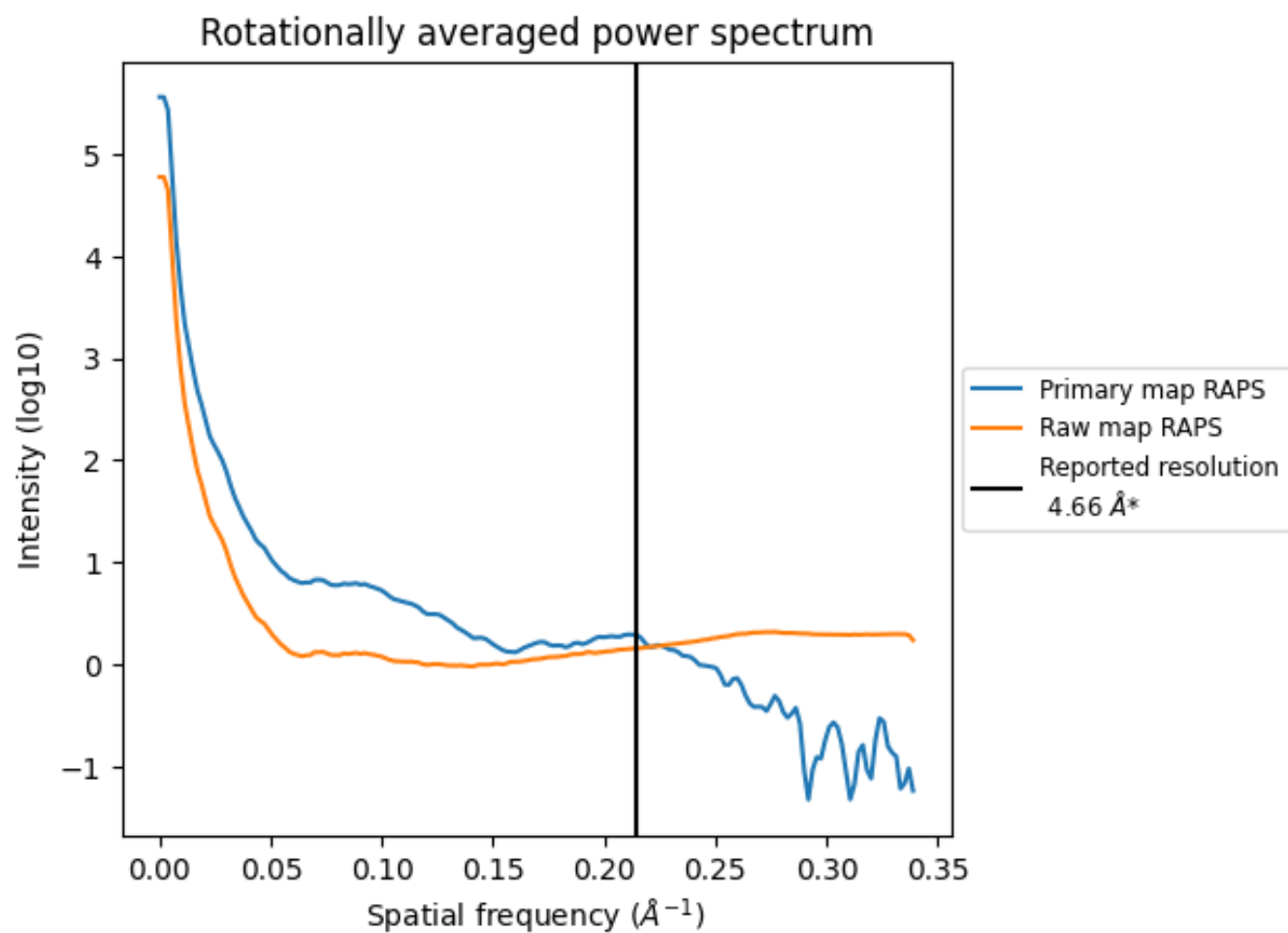
*Reported resolution corresponds to spatial frequency of 0.215 Å^{-1}

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 ⓘ
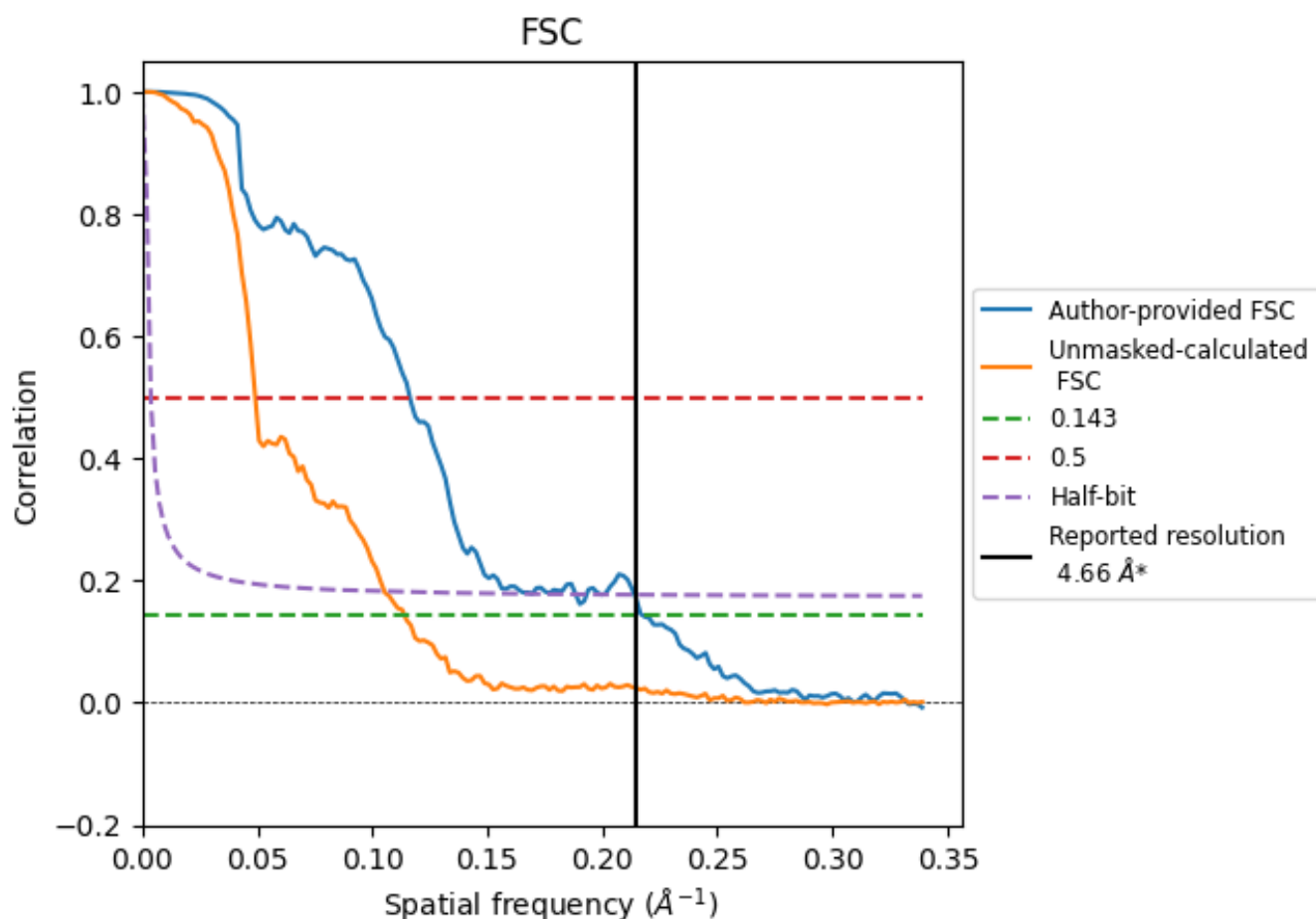
*Reported resolution corresponds to spatial frequency of 0.215 $\mathrm{\AA}^{-1}$

8.2   Resolution estimates (i)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.66	-	-
Author-provided FSC curve	4.60	8.60	5.31
Unmasked-calculated*	8.77	20.37	9.51

*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 8.77 differs from the reported value 4.66 by more than 10 %

9   Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-66106 and PDB model 9WMV. Per-residue inclusion information can be found in section 3 on page 17.

9.1   Map-model overlay ⓘ

X   Y   Z
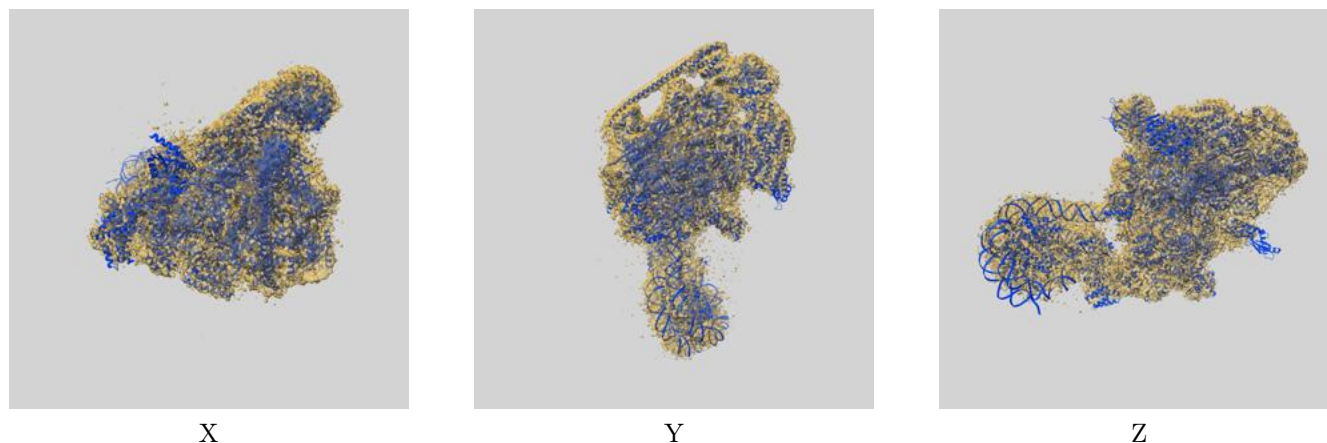
The images above show the 3D surface view of the map at the recommended contour level 0.015 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2　Q-score mapped to coordinate model ⓘ

X　　　　　　　　　　　　　Y　　　　　　　　　　　　　Z
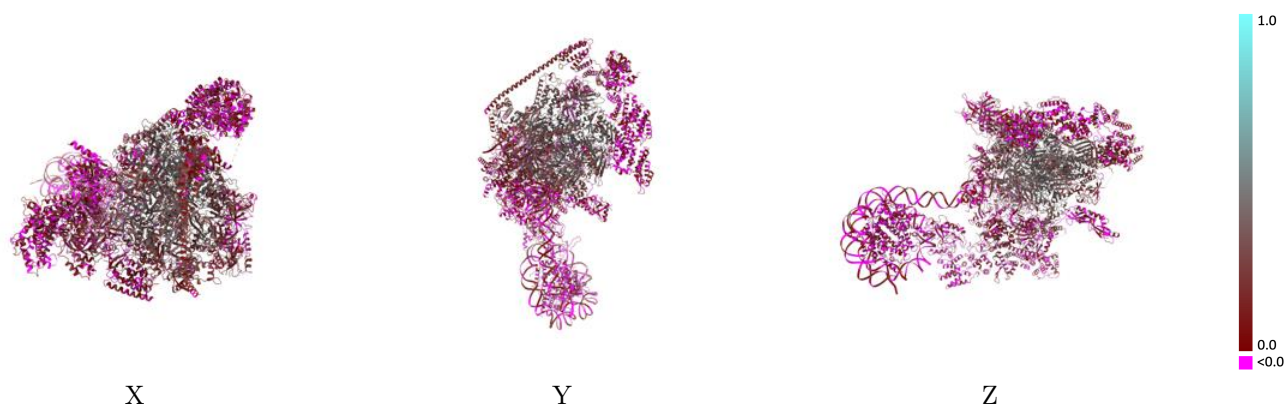
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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
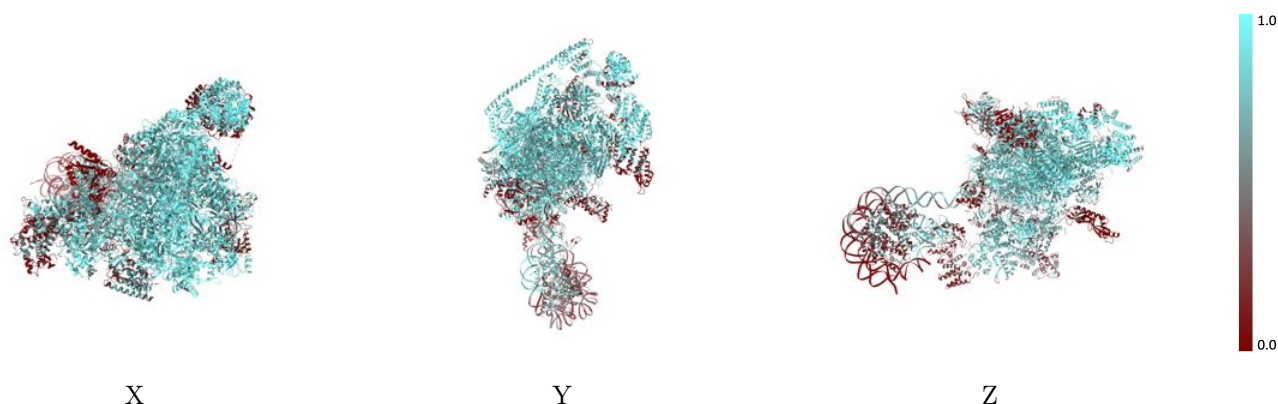
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.015).

9.4 Atom inclusion ⓘ
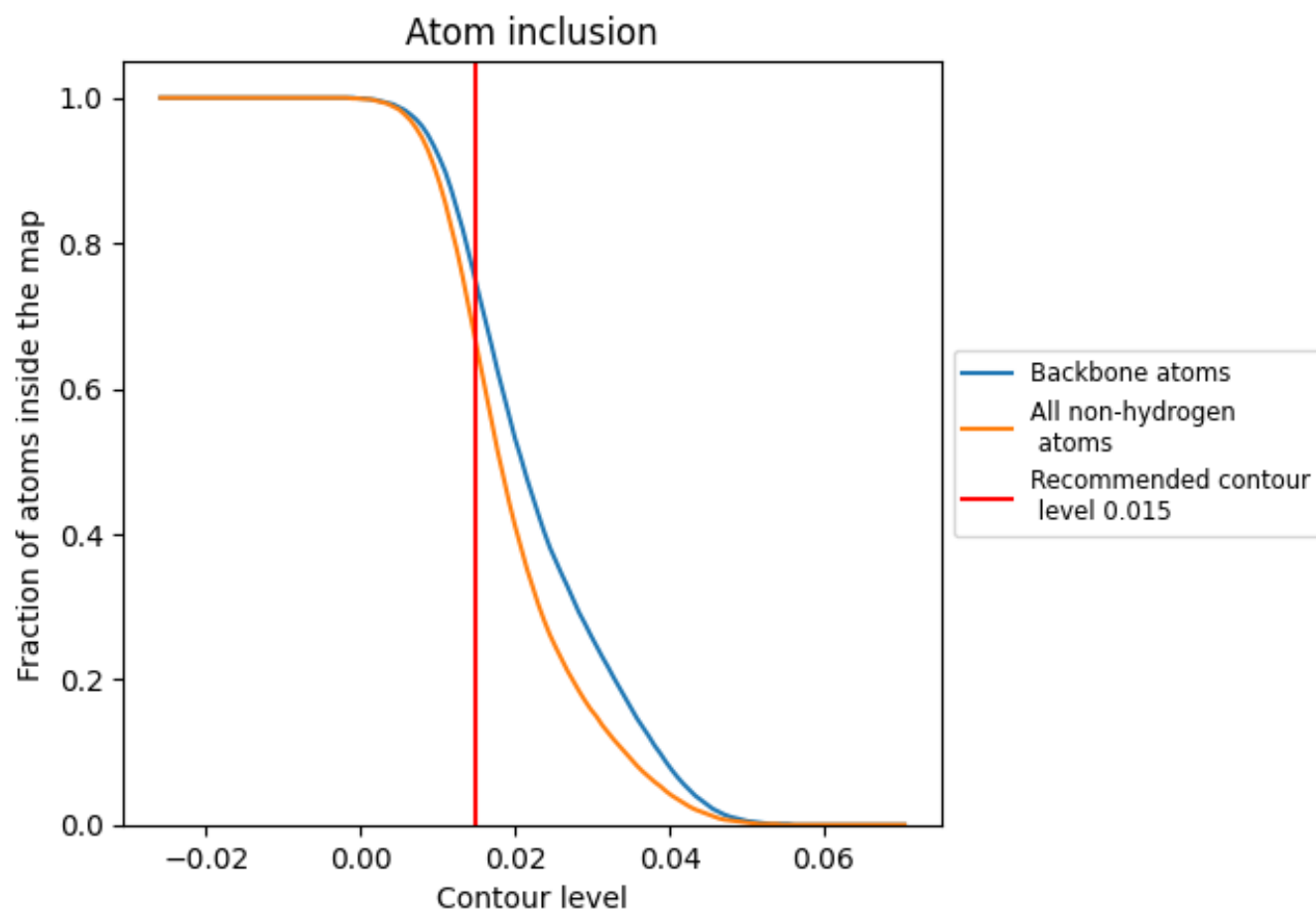
At the recommended contour level, 74% of all backbone atoms, 66% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.015) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.6600	0.1680
A	0.8930	0.3470
B	0.8700	0.3400
C	0.8790	0.3480
D	0.7450	0.1530
E	0.9270	0.3100
F	0.8980	0.3800
G	0.8150	0.2200
H	0.9040	0.3550
I	0.8330	0.1930
J	0.8870	0.3580
K	0.9160	0.3730
L	0.9110	0.3080
M	0.7820	0.1120
N	0.4570	0.0640
P	0.8590	0.2480
T	0.4800	0.0760
V	0.8210	0.0690
W	0.6620	0.1200
a	0.5960	-0.0130
b	0.6050	0.0130
c	0.3180	-0.0050
d	0.3090	-0.0140
e	0.2680	0.0020
f	0.4180	0.0560
g	0.4030	-0.0170
h	0.3870	0.0050
m	0.5280	0.0720
n	0.5490	0.0820
q	0.6900	0.0710
r	0.3420	0.0740
s	0.3160	0.0210
u	0.3750	0.0760
v	0.4040	0.0450
x	0.6370	0.1580

1.0

0.0
<0.0