



## Full wwPDB EM Validation Report ⓘ

Jun 26, 2024 – 04:51 PM JST

PDB ID : 7XTD  
EMDB ID : EMD-33447  
Title : RNA polymerase II elongation complex transcribing a nucleosome (EC58oct)  
Authors : Ehara, H.; Kujirai, T.; Shirouzu, M.; Kurumizaka, H.; Sekine, S.  
Deposited on : 2022-05-16  
Resolution : 3.90 Å (reported)

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

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

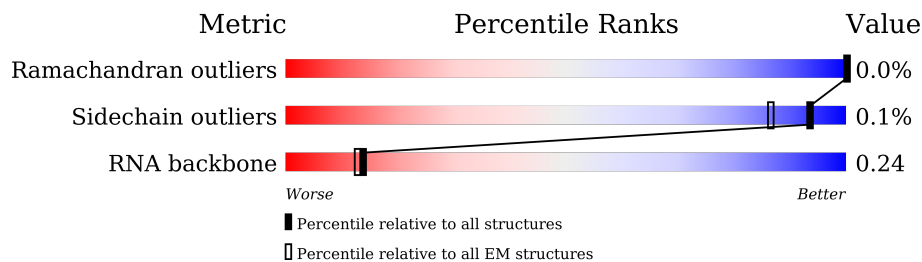
EMDB validation analysis : 0.0.1.dev92  
MolProbity : 4.02b-467  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP)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

# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:  
*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.90 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826
RNA backbone	4643	859

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  $\geq 3$ , 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  $\leq 5\%$ . 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	 80% 19%
2	B	1227	 95% 5%
3	C	304	 87% 13%
4	D	186	 20% 94% 6%
5	E	214	 99%
6	F	155	 54% 46%
7	G	171	 15% 100%
8	H	145	 92% 8%



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Mol	Chain	Length	Quality of chain
9	I	115	30% 97%
10	J	72	93% 7%
11	K	118	96%
12	L	72	6% 62% 38%
13	M	113	23% 56% 43%
14	N	198	34% 35% 20% 43%
15	P	19	21% 37% 58% 5%
16	T	198	36% 43% 18% 38%
17	V	108	37% 98%
18	W	911	25% 59% 41%
19	m	1503	37% 79% 21%
20	n	417	13% 33% 67%
21	q	1084	59% 86% 14%
22	r	544	37% 49% 51%
23	u	459	29% 45% 55%
24	v	396	70% 88% 12%
25	x	395	20% 52% 48%
26	a	139	54% 55% 45%
26	e	139	64% 64% 35%
27	b	106	78% 78% 22%
27	f	106	73% 73% 26%
28	c	133	77% 77% 23%
28	g	133	53% 52% 47%
29	d	129	73% 74% 26%
29	h	129	72% 72% 28%

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Mol	Chain	Length	Quality of chain
30	j	1008	 <p>46% 54%</p>
31	k	531	 <p>81% 79% 19%</p>

## 2 Entry composition [i](#)

There are 33 unique types of molecules in this entry. The entry contains 81668 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
			Total	C	N	O	S		
1	A	1404	11064	6975	1930	2089	70	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	1164	9284	5848	1639	1739	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
			Total	C	N	O	S		
3	C	263	2098	1319	354	413	12	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	D	174	1349	828	244	274	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
			Total	C	N	O	S		
5	E	213	1741	1094	312	325	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
			Total	C	N	O	S		
6	F	84	677	429	114	131	3	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	G	171	1325	858	214	248	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
			Total	C	N	O	S		
8	H	133	1053	671	169	209	4	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	I	111	917	565	161	180	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
			Total	C	N	O	S		
10	J	67	554	355	97	96	6	0	0

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

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

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

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

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

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
13	M	64	505	318	82	99	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
			Total	C	N	O	P		
14	N	112	2305	1099	389	705	112	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
15	P	19	399	178	64	138	19	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
16	T	123	2512	1189	497	703	123	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
17	V	106	824	512	150	155	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
			Total	C	N	O	S		
18	W	533	4232	2666	752	812	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 Transcription elongation factor Spt6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
19	m	1187	9730	6162	1663	1877	28	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 20 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		
20	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 21 is a protein called Component of the Paf1p complex.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
21	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
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 22 is a protein called RNAPII-associated chromatin remodeling Paf1 complex sub-

unit.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
22	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 23 is a protein called Leo1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
23	u	208	1707	1063	304	337	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 24 is a protein called RNAP II-associated protein.

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

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
v	-2	GLY	-	expression tag	UNP C4R997

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

- Molecule 25 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	
			Total	C	N	O			S
25	x	205	1682	1086	287	307	2	0	0

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
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

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Chain	Residue	Modelled	Actual	Comment	Reference
x	0	GLY	-	expression tag	UNP C4R1E6

- Molecule 26 is a protein called Histone H3.3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
26	a	76	615	390	115	108	2	0	0
26	e	90	735	464	140	129	2	0	0

There are 6 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
e	-3	GLY	-	expression tag	UNP P84243
e	-2	SER	-	expression tag	UNP P84243
e	-1	HIS	-	expression tag	UNP P84243

- Molecule 27 is a protein called Histone H4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
27	b	83	662	418	129	114	1	0	0
27	f	78	619	391	120	107	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
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 28 is a protein called Histone H2A type 1-B/E.

Mol	Chain	Residues	Atoms				AltConf	Trace
28	c	103	Total	C	N	O	0	0
			796	502	155	139		
28	g	70	Total	C	N	O	0	0
			544	342	109	93		

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 29 is a protein called Histone H2B type 1-J.

Mol	Chain	Residues	Atoms					AltConf	Trace
29	d	95	Total	C	N	O	S	0	0
			746	468	136	140	2		
29	h	93	Total	C	N	O	S	0	0
			725	456	130	137	2		

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
d	-6	GLY	-	expression tag	UNP P06899
d	-5	SER	-	expression tag	UNP P06899
d	-4	HIS	-	expression tag	UNP P06899
h	-6	GLY	-	expression tag	UNP P06899
h	-5	SER	-	expression tag	UNP P06899
h	-4	HIS	-	expression tag	UNP P06899

- Molecule 30 is a protein called FACT complex subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
30	j	466	Total	C	N	O	S	0	0
			3780	2401	658	708	13		

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
j	-2	GLY	-	expression tag	UNP C4QYQ8
j	-1	PRO	-	expression tag	UNP C4QYQ8
j	0	GLY	-	expression tag	UNP C4QYQ8

- Molecule 31 is a protein called FACT complex subunit POB3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
31	k	429	3502	2215	613	664	10	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
k	-2	GLY	-	expression tag	UNP F2QNN8
k	-1	PRO	-	expression tag	UNP F2QNN8
k	0	GLY	-	expression tag	UNP F2QNN8

- Molecule 32 is ZINC ION (three-letter code: ZN) (formula: Zn).

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

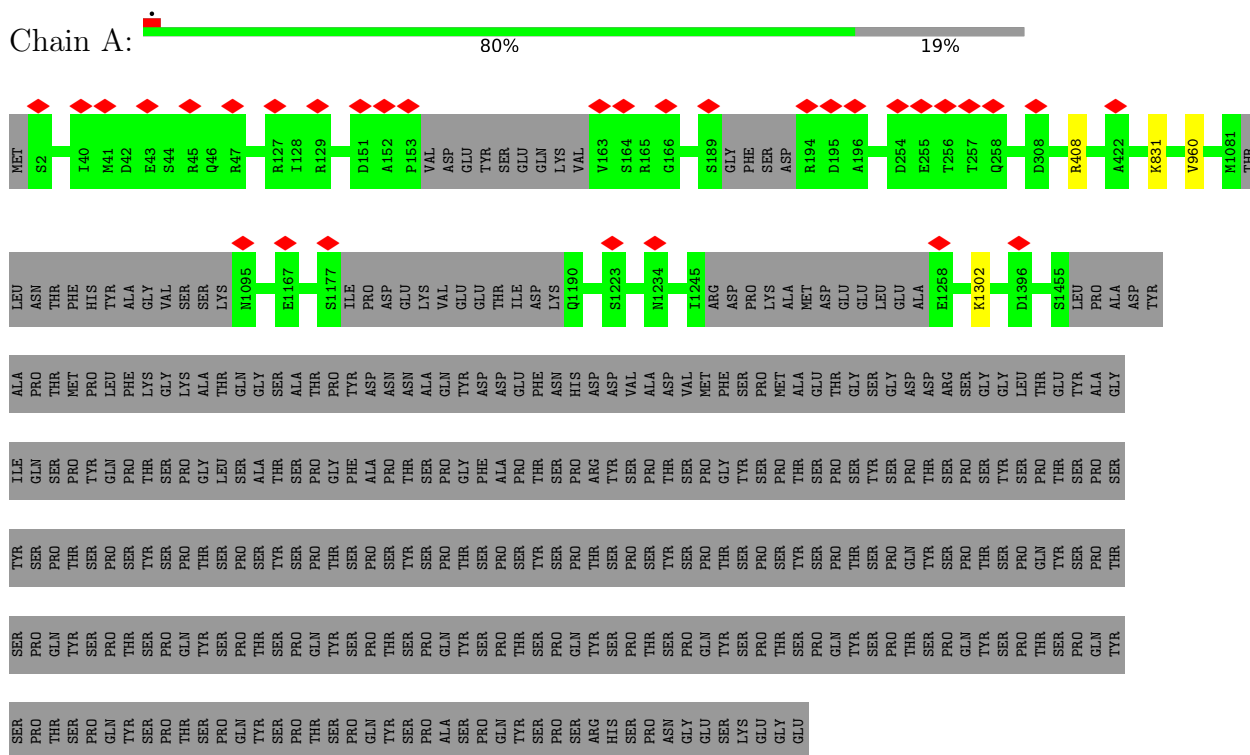
- Molecule 33 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

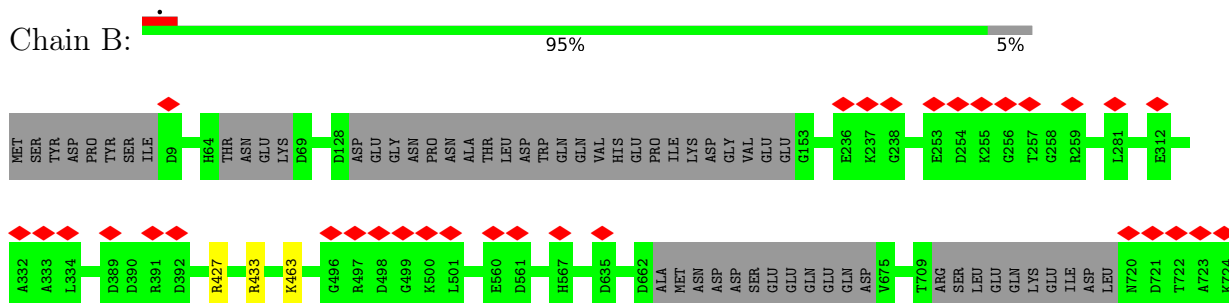
### 3 Residue-property plots [i](#)

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.

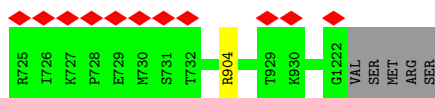
- Molecule 1: DNA-directed RNA polymerase subunit



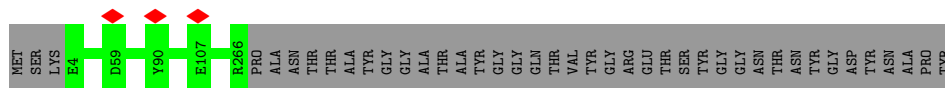
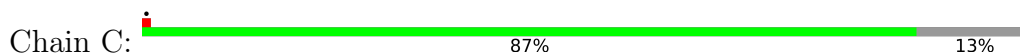
- Molecule 2: DNA-directed RNA polymerase subunit beta



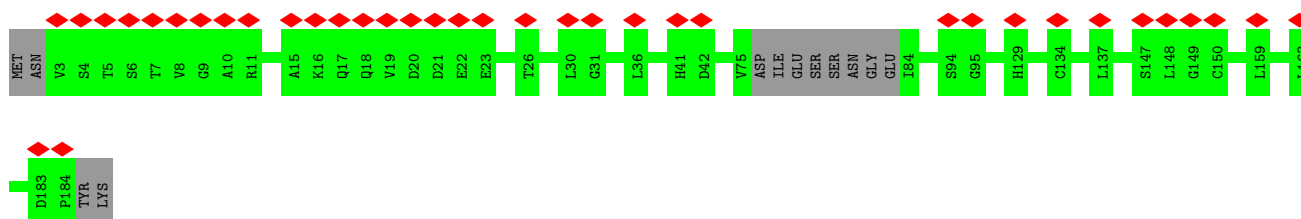




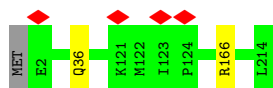
- Molecule 3: RNA polymerase II third largest subunit B44, part of central core



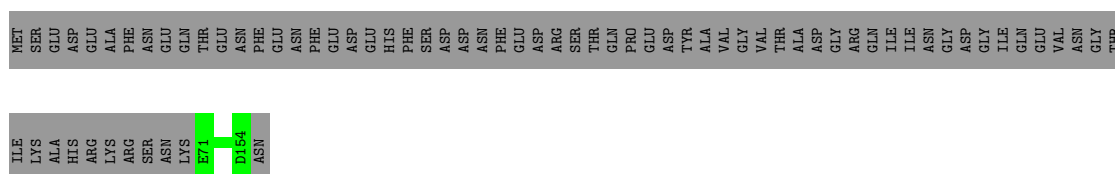
- Molecule 4: RNA polymerase II subunit B32



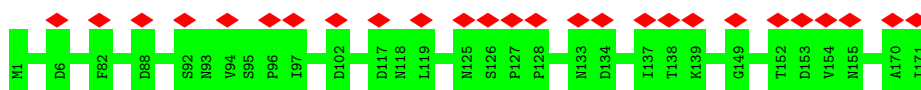
- Molecule 5: DNA-directed RNA polymerases I, II, and III subunit RPABC1



- Molecule 6: RNA polymerase subunit ABC23, common to RNA polymerases I, II, and III

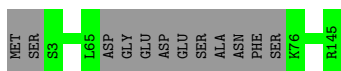


- Molecule 7: RNA polymerase II subunit

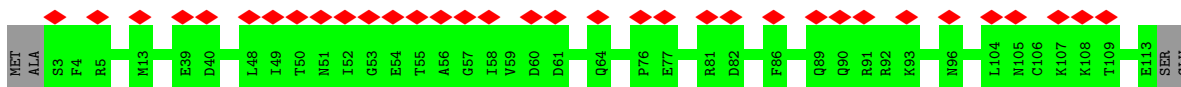


- Molecule 8: DNA-directed RNA polymerases I, II, and III subunit RPABC3

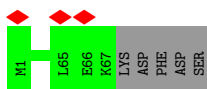




- Molecule 9: DNA-directed RNA polymerase subunit



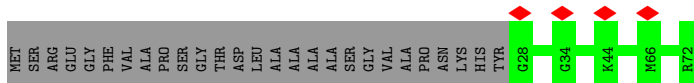
- Molecule 10: RNA polymerase subunit ABC10-beta, common to RNA polymerases I, II, and III



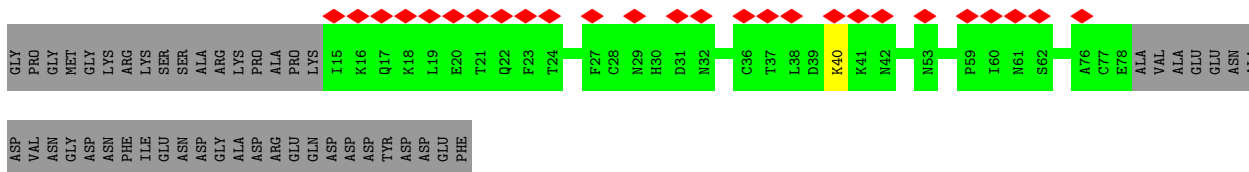
- Molecule 11: RNA polymerase II subunit B12.5



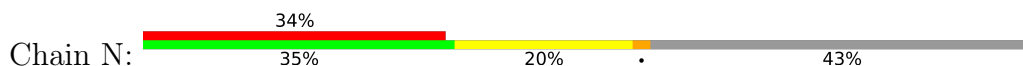
- Molecule 12: RNA polymerase subunit ABC10-alpha

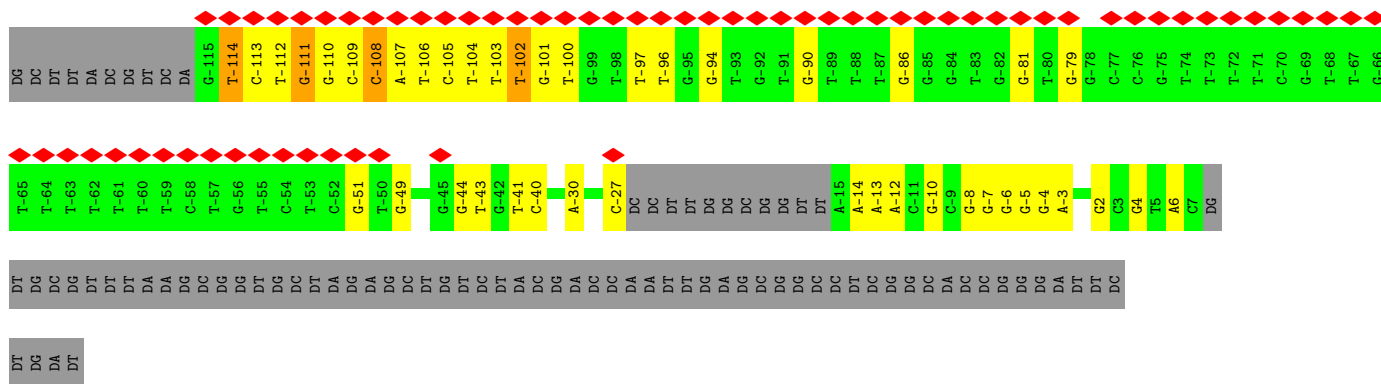


- Molecule 13: Transcription elongation factor 1 homolog

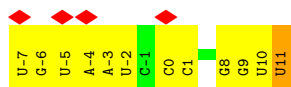


- Molecule 14: DNA (198-MER)

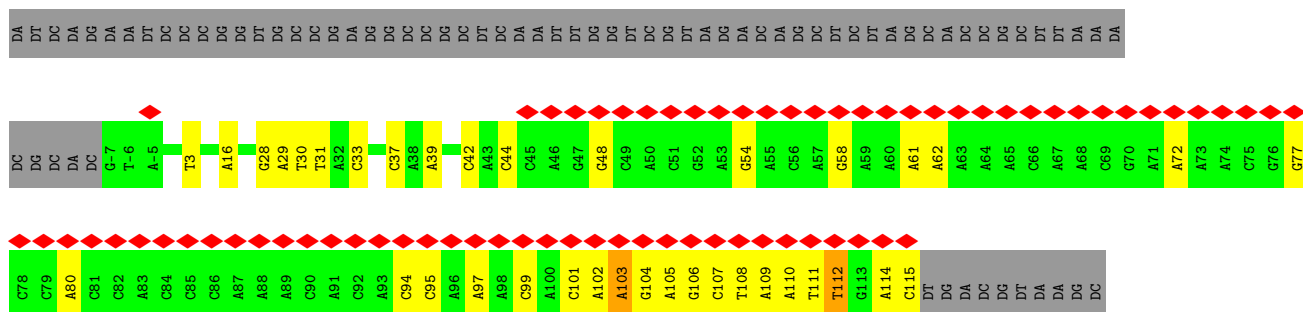




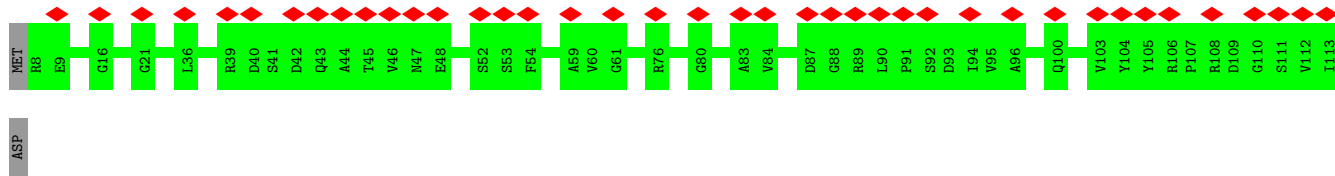
● Molecule 15: RNA (5'-R(P\*UP\*GP\*UP\*AP\*AP\*UP\*CP\*CP\*CP\*CP\*UP\*UP\*GP\*GP\*CP\*GP\*GP\*UP\*U)-3')



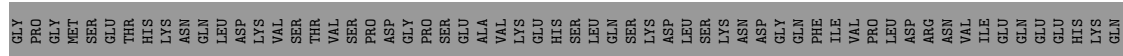
● Molecule 16: DNA (198-MER)

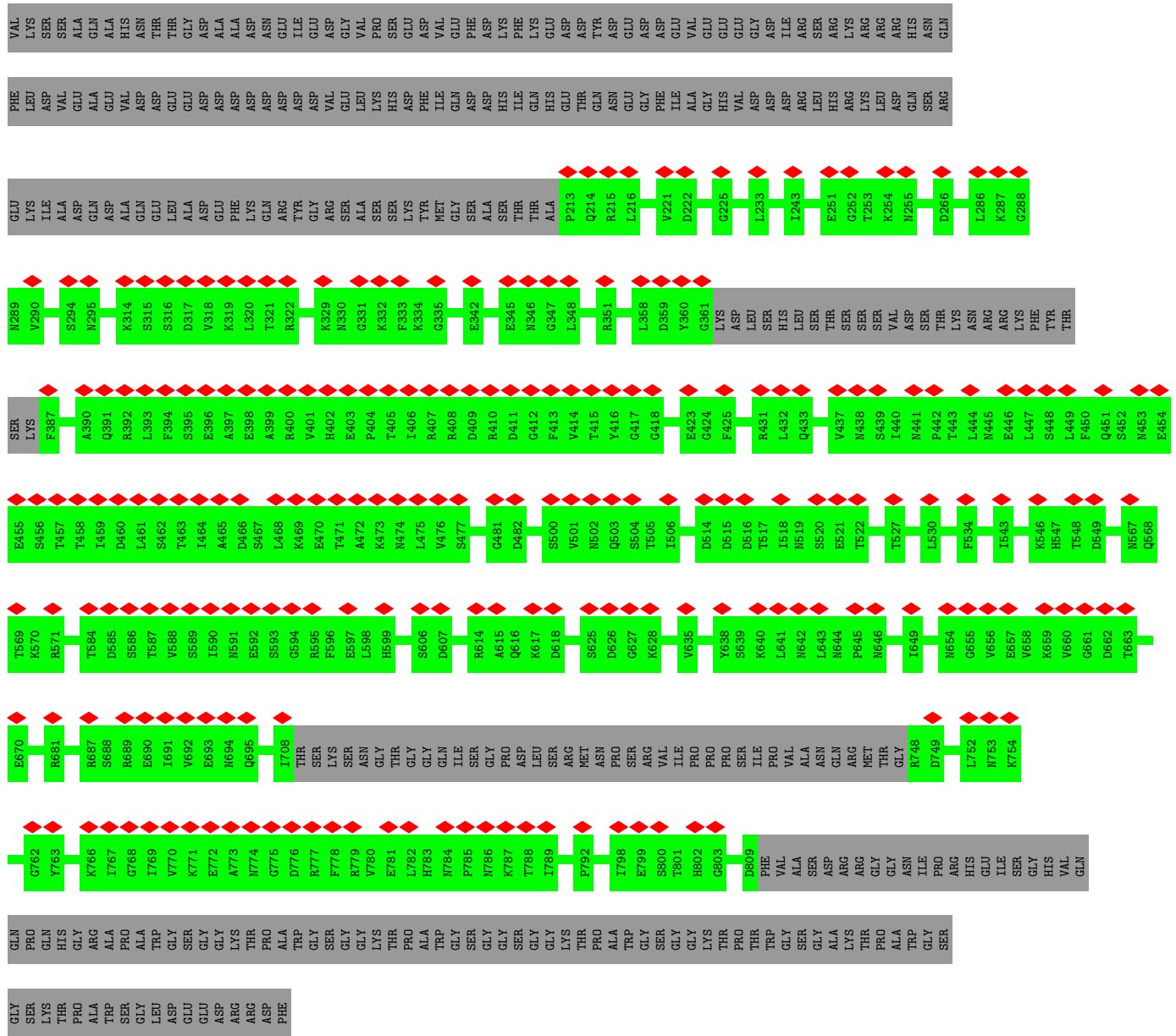


● Molecule 17: Transcription elongation factor SPT4

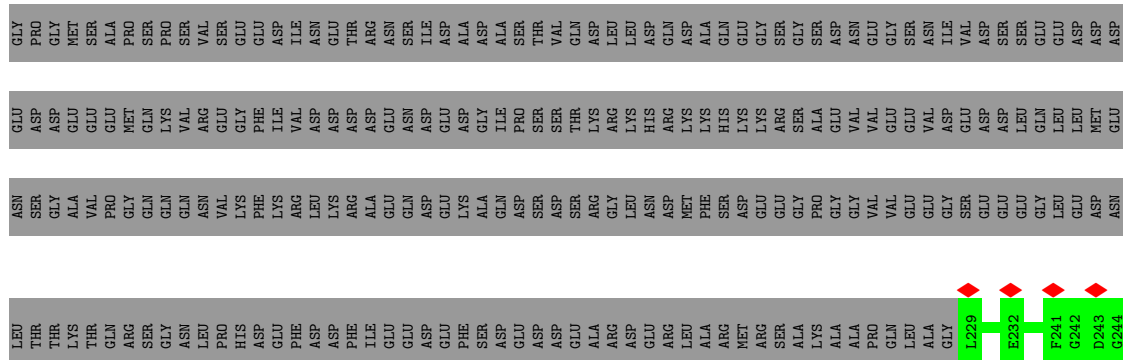
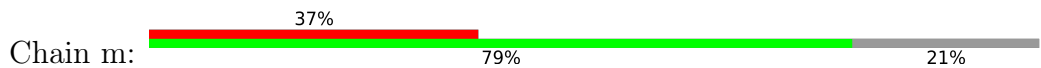


● Molecule 18: Transcription elongation factor SPT5



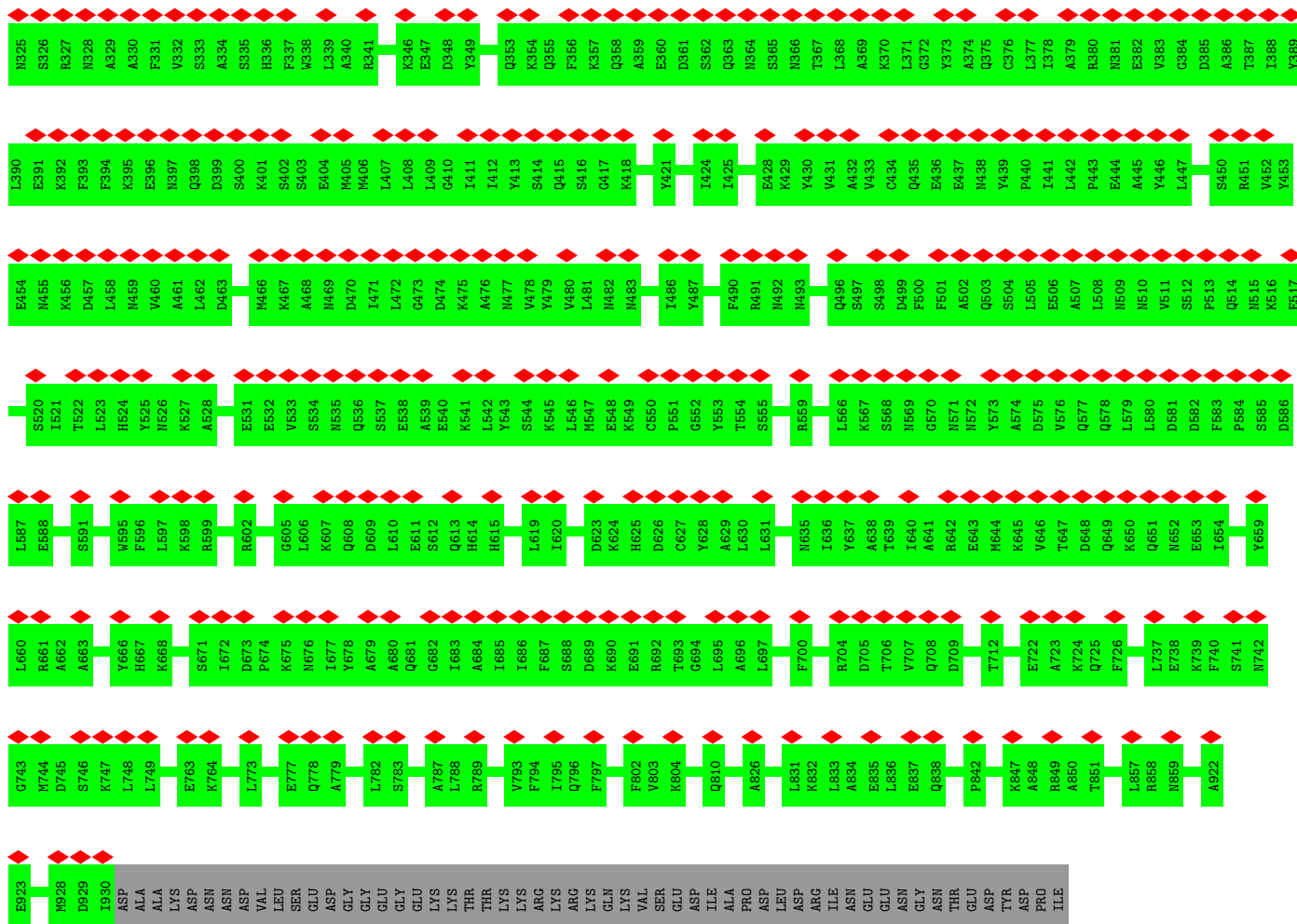


● Molecule 19: Transcription elongation factor Spt6

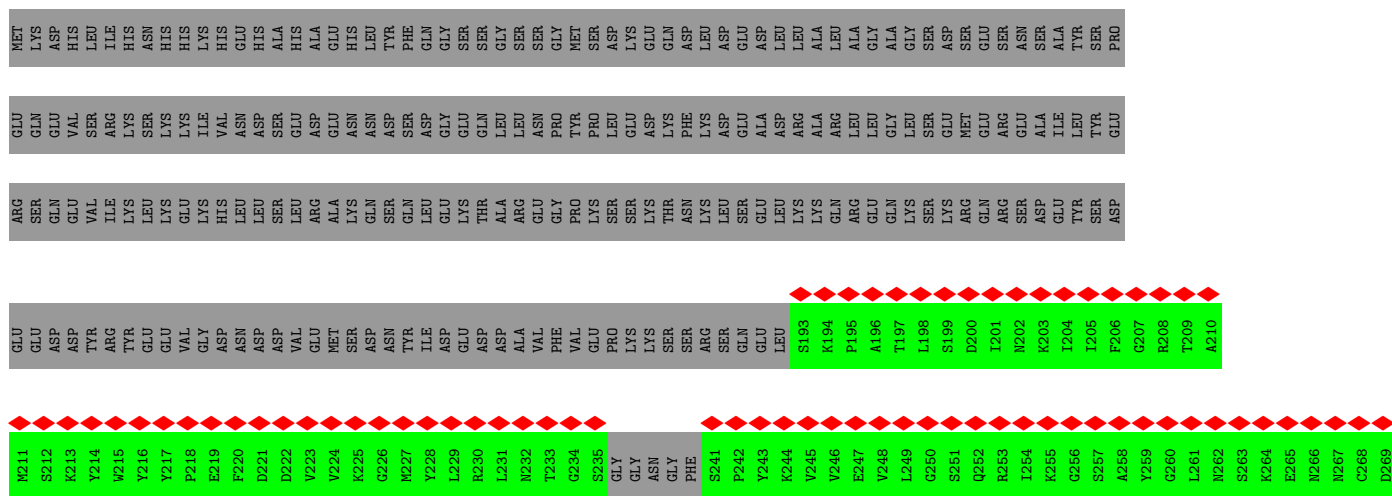


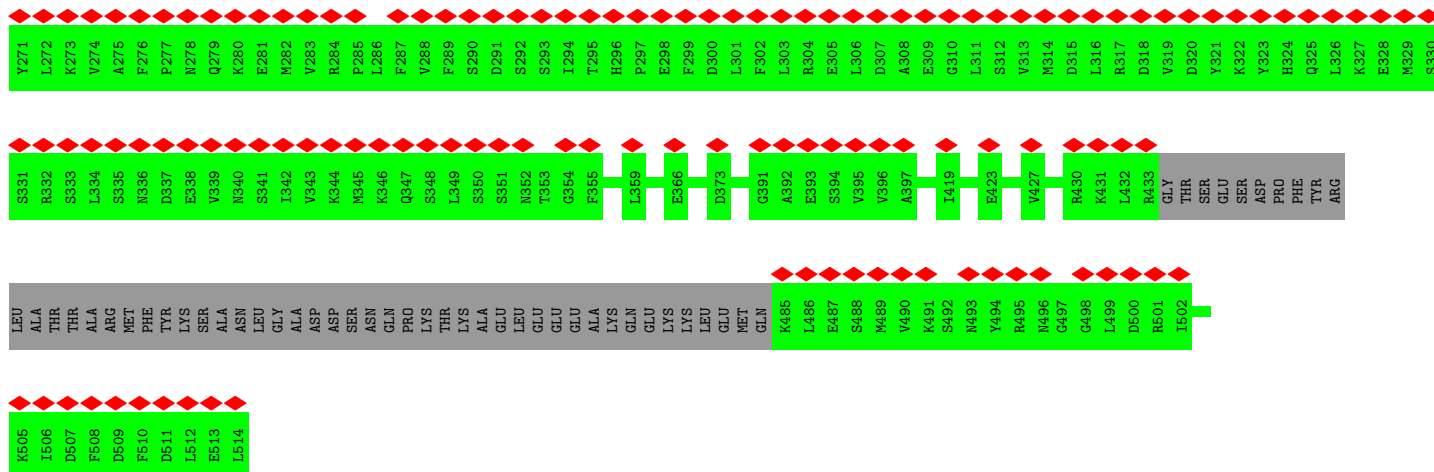
M1427	M1428	P1428	T1429	S1430	E1431	I1432	K1433	V1434	M1435	N1436	V1437	K1438	A1439	L1440	P1441	D1442	G1443	L1444	L1445	L1446	A1447	M1448	M1449	V1450	Y1451	K1452	D1453	T1454	M1455	L1456	L1457	C1458	M1459	K1460	A1461	K1462	T1463	L1464	M1465	S1466	S1467	R1468	R1469	GLN	ILE	LYS	GLN	ARG	SER	ASN	ARG	ALA	ALA	GLY	GLY	GLU	TYR	W1420	W1421	W1422	W1423	W1424	K1425	L1426
V1367	M1368	M1369	V1370	A1371	M1372	K1373	V1374	E1375	L1376	M1377	V1378	S1379	H1380	D1381	K1382	F1383	M1384	S1385	D1386	S1387	L1388	D1389	Y1390	Y1391	K1392	E1393	W1394	L1395	L1396	R1397	Y1398	S1399	K1400	A1401	M1402	G1403	G1404	R1405	S1406	H1407	Y1408	I1409	F1410	T1411	F1412	M1413	R1414	K1415	P1417	G1418	W1419	F1421	L1422	L1423	L1424	K1425	L1426							
V1307	I1308	R1309	P1310	S1311	S1312	K1313	G1314	S1315	M1316	H1317	I1318	T1319	I1320	S1321	M1322	K1323	A1325	P1326	Q1327	L1328	Y1329	Q1330	H1331	I1332	D1333	V1334	L1335	L1336	E1337	N1338	K1339	I1340	D1341	A1342	M1343	A1344	I1345	G1346	M1347	V1348	L1349	L1350	V1351	G1352	K1353	Y1354	R1355	K1416	P1417	G1418	W1419	F1421	L1422	L1423	L1424	K1425	L1426							
V1212	G1213	Q1214	R1217	F1228	R1236	E1240	M1241	Q1242	V1243	A1244	G1245	L1246	M1247	V1248	E1267	I1268	D1269	K1270	Q1271	M1272	E1273	E1274	S1275	M1276	E1277	S1278	R1279	V1280	I1281	K1282	H1283	P1284	F1285	F1286	H1287	M1288	M1289	K1290	S1291	K1292	A1294	E1295	D1296	Y1297	L1298	A1299	A1300	R1301	P1302	V1303	G1304	D1305	V1306											
L1105	Q1117	K1120	R1121	S1122	I1126	I1127	K1128	E1129	E1130	L1131	Q1132	S1133	R1136	I1137	I1138	D1141	L1154	T1155	E1157	T1158	V1159	D1160	S1161	F1162	I1168	Y1171	V1172	R1173	K1174	V1175	Q1185	S1186	L1187	I1188	A1189	E1199	P1200	N1201	D1202	R1203	Y1297	L1298	A1299	A1300	R1301	P1302	V1303	G1304	D1305	V1306														
L1105	Q1117	K1120	R1121	S1122	I1126	I1127	K1128	E1129	E1130	L1131	Q1132	S1133	R1136	I1137	I1138	D1141	L1154	T1155	E1157	T1158	V1159	D1160	S1161	F1162	I1168	Y1171	V1172	R1173	K1174	V1175	Q1185	S1186	L1187	I1188	A1189	E1199	P1200	N1201	D1202	R1203	Y1297	L1298	A1299	A1300	R1301	P1302	V1303	G1304	D1305	V1306														
S866	D867	R872	Y875	V876	N877	A892	E893	Y894	P895	N896	R897	E917	L921	S924	N935	L936	R939	L942	I953	L956	V959	D960	I961	N962	E963	A964	R965	R966	A967	P968	Y969	H970	A971	L972	A973	C978	Q993	S997	N998	L999	V1000	L1005																						
V739	K746	G760	T761	I762	P763	L768	N774	R775	A778	D785	V789	V790	K791	S792	F796	D797	F800	Q801	S802	R803	R811	S815	N816	N819	S826	G827	F828	E841	N844	L848	D853	N854	GLU	TYR	GLY	TYR	ASP	ARG	GLU	GLU	ASP	GLY																						
L657	Q661	N664	D665	G666	I670	K671	V672	E673	L674	P675	M676	L677	S678	F679	V680	V681	D682	H683	F684	K689	S690	D691	A702	L703	R704	N705	D706	A707	W708	K709	Q710	S711	D713	K714	L715	I716	P717	L718	V719	Q720	L721	M722	V723	K724	E725	R728	R729	E732	R733															
Q548	S549	L552	I559	I569	M570	S571	T572	E573	K574	D575	K576	T577	T578	F579	I580	S581	S582	E583	Y586	Q587	K590	Q591	S594	L597	S598	F602	I603	R604	R608	Q612	S613	F614	G615	E620	R624	Q628	E632	S633	R644	S647	A648	A651																						
D467	D468	M480	L481	T482	A483	V484	ALA	GLU	LEU	SER	ILE	GLU	GLY	ASN	SER	GLY	ALA	GLU	ASP	GLU	ILE	GLN	THR	THR	LVS	SER	SER	PHE	ALA	VAL	M511	K512	R513	K514	Y515	S516	K517	Y518	A519	I520	Y521	D522	R523	Q526	V533	Q534	A537	R543	L546	A547														
K339	L340	E341	D344	F345	I370	I374	M386	D399	S400	M401	M402	T403	I404	I405	V406	K407	L408	L409	M410	E411	W415	R416	I417	V418	Q419	L420	D421	L422	D423	S426	A433	L434	Q440	L443	D444	V445	V446	F454	G455	S456	A457	R458	T459	L460	S461	Q464																		
L251	E254	E256	M257	E258	Q259	P260	GLN	GLN	ASP	GLN	GLU	TYR	ASP	ALA	GLU	ILE	GLN	LVS	THR	THR	T278	S279	L280	A281	D282	V283	F284	E285	P286	S287	E288	L289	K290	E291	K292	M293	L294	L306	R309	A312	Y313	R314	K315	S316	I317	K318	N319	Y320	L338															



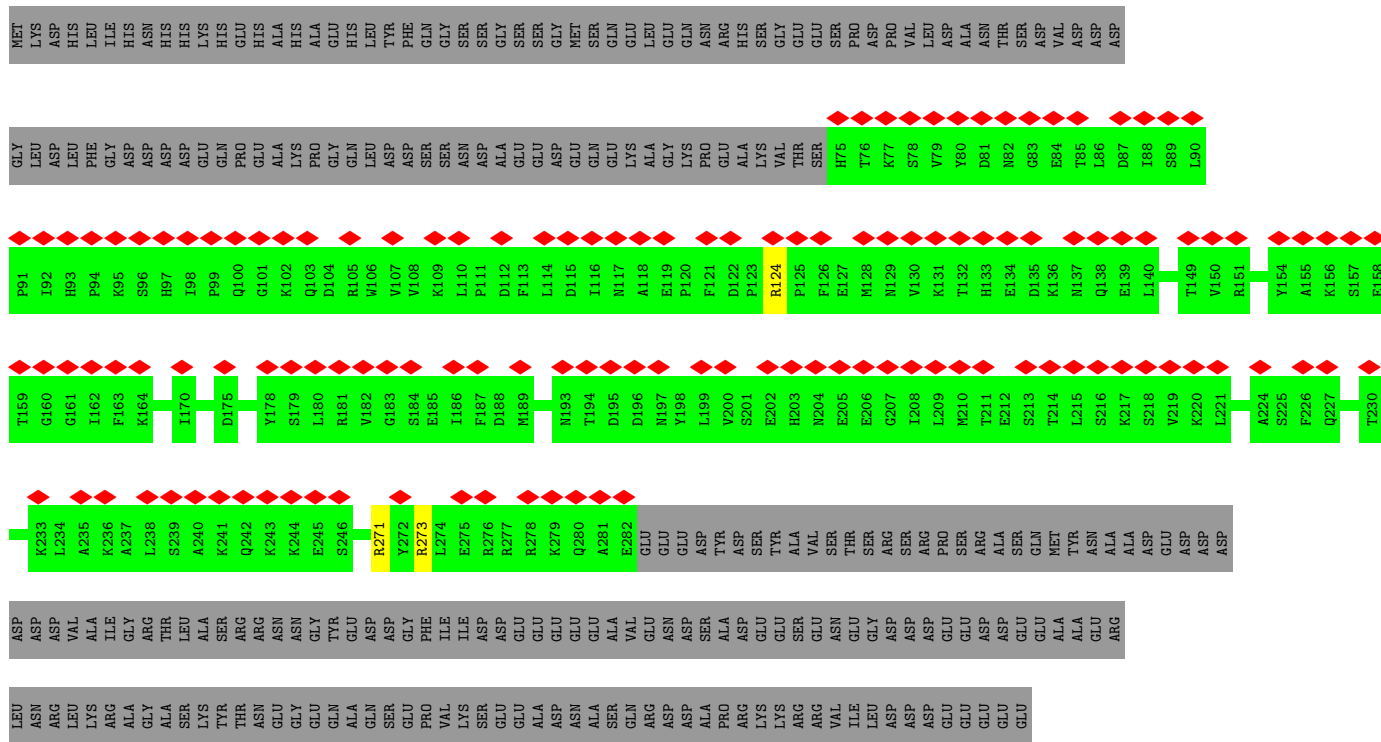
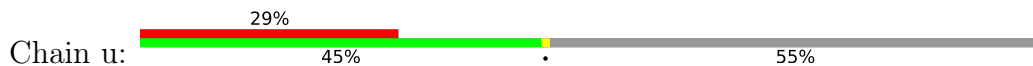


● Molecule 22: RNAPII-associated chromatin remodeling Paf1 complex subunit

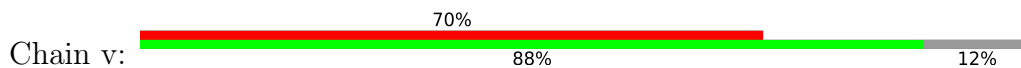




• Molecule 23: Leo1

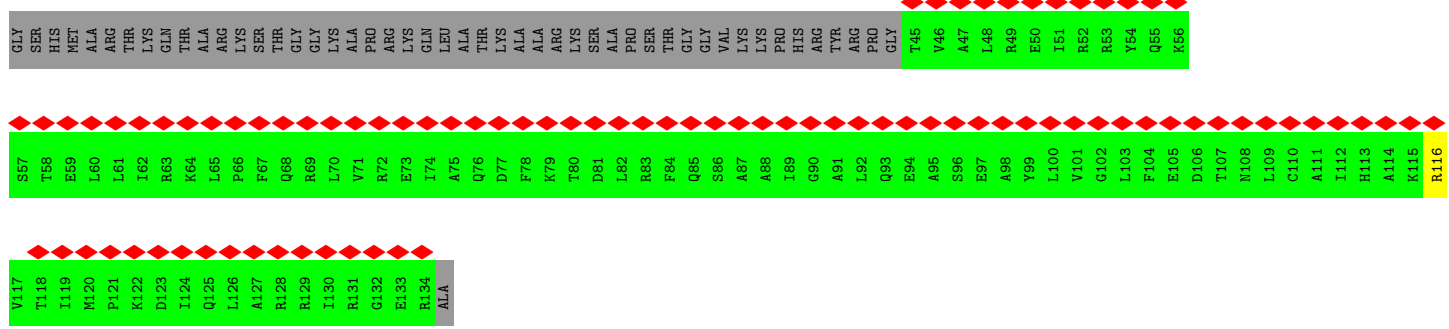


• Molecule 24: RNAP II-associated protein

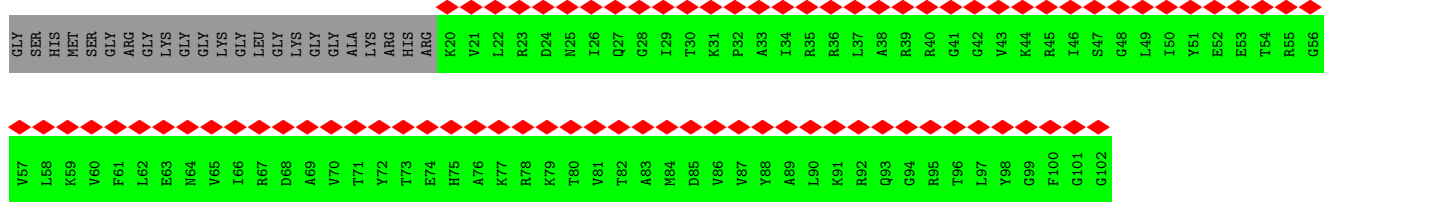
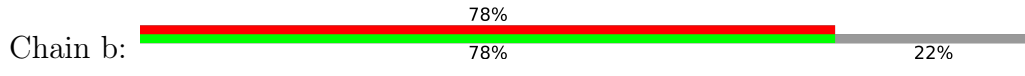




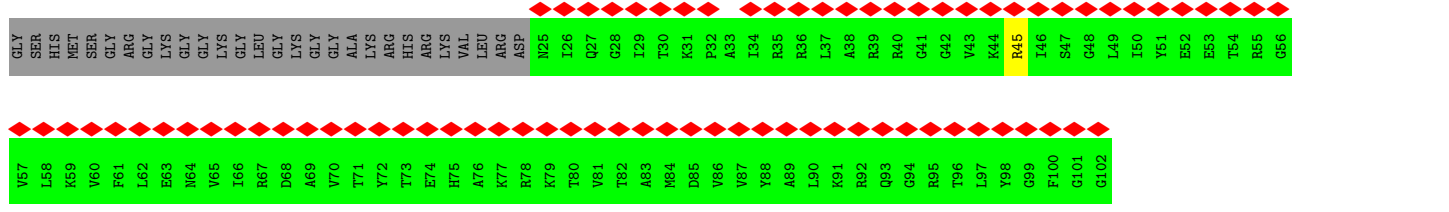




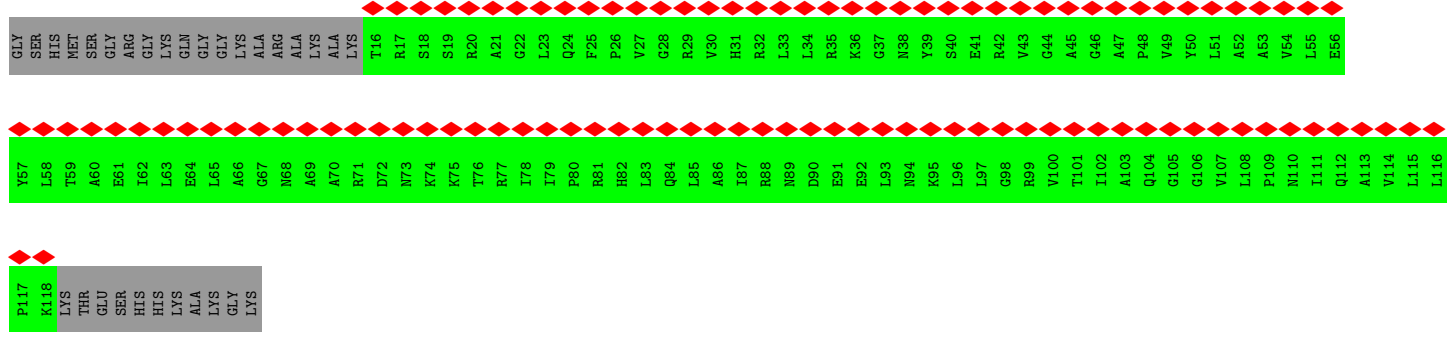
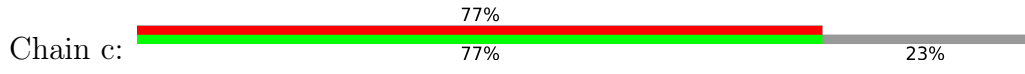
• Molecule 27: Histone H4



• Molecule 27: Histone H4



• Molecule 28: Histone H2A type 1-B/E



• Molecule 28: Histone H2A type 1-B/E







## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	38828	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 ( $e^-/\text{\AA}^2$ )	51	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.096	Depositor
Minimum map value	-0.052	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.003	Depositor
Recommended contour level	0.009	Depositor
Map size ( $\text{\AA}$ )	356.16, 356.16, 356.16	wwPDB
Map dimensions	240, 240, 240	wwPDB
Map angles ( $^\circ$ )	90.0, 90.0, 90.0	wwPDB
Pixel spacing ( $\text{\AA}$ )	1.484, 1.484, 1.484	Depositor

## 5 Model quality i

### 5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: 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	0.32	0/11267	0.49	0/15222
2	B	0.34	0/9464	0.53	2/12763 (0.0%)
3	C	0.33	0/2139	0.49	0/2895
4	D	0.24	0/1361	0.46	0/1837
5	E	0.30	0/1773	0.50	0/2385
6	F	0.33	0/687	0.50	0/931
7	G	0.28	0/1354	0.48	0/1837
8	H	0.33	0/1070	0.49	0/1444
9	I	0.24	0/934	0.50	0/1257
10	J	0.36	0/563	0.51	0/753
11	K	0.32	0/953	0.50	0/1291
12	L	0.37	0/365	0.62	0/484
13	M	0.25	0/513	0.41	0/693
14	N	1.13	23/2575 (0.9%)	1.32	34/3978 (0.9%)
15	P	0.43	0/443	0.86	2/687 (0.3%)
16	T	1.14	17/2827 (0.6%)	1.29	41/4352 (0.9%)
17	V	0.24	0/840	0.50	0/1140
18	W	0.25	0/4300	0.49	0/5812
19	m	0.24	0/9925	0.45	0/13424
20	n	0.24	0/1132	0.42	0/1526
21	q	0.24	0/7689	0.40	0/10368
22	r	0.30	0/2169	0.53	0/2901
23	u	0.34	0/1740	0.57	2/2347 (0.1%)
24	v	0.25	0/2944	0.47	0/3973
25	x	0.26	0/1716	0.45	0/2310
26	a	0.29	0/622	0.54	0/834
26	e	0.33	0/743	0.61	1/996 (0.1%)
27	b	0.30	0/669	0.59	0/894
27	f	0.34	0/626	0.63	1/837 (0.1%)
28	c	0.29	0/806	0.55	0/1089
28	g	0.34	0/552	0.59	1/743 (0.1%)
29	d	0.30	0/757	0.51	0/1015

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
29	h	0.28	0/736	0.47	0/990
30	j	0.68	0/3855	0.86	4/5191 (0.1%)
31	k	0.68	0/3579	0.88	9/4833 (0.2%)
All	All	0.44	40/83688 (0.0%)	0.63	97/114032 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
14	N	0	5
16	T	0	2
30	j	0	1
31	k	0	2
All	All	0	10

All (40) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
14	N	-40	DC	C1'-N1	6.95	1.58	1.49
16	T	30	DT	C1'-N1	6.67	1.57	1.49
16	T	37	DC	C1'-N1	6.60	1.57	1.49
14	N	-96	DT	C1'-N1	6.50	1.57	1.49
14	N	-27	DC	C1'-N1	6.47	1.57	1.49
16	T	95	DC	C1'-N1	6.45	1.57	1.49
16	T	72	DA	C1'-N9	-6.44	1.38	1.47
14	N	-79	DG	C1'-N9	-6.44	1.38	1.47
14	N	-8	DG	C1'-N9	-6.43	1.38	1.47
16	T	33	DC	C1'-N1	6.41	1.57	1.49
16	T	61	DA	C1'-N9	-6.28	1.38	1.47
16	T	42	DC	C1'-N1	6.24	1.57	1.49
14	N	-10	DG	C1'-N9	-6.22	1.38	1.47
14	N	-7	DG	C1'-N9	-6.18	1.38	1.47
16	T	31	DT	C1'-N1	6.10	1.57	1.49
14	N	-94	DG	C1'-N9	-6.02	1.38	1.47
14	N	-5	DG	C1'-N9	-5.99	1.38	1.47
16	T	48	DG	C1'-N9	-5.96	1.39	1.47
16	T	44	DC	C1'-N1	5.90	1.56	1.49
14	N	-49	DG	C1'-N9	-5.89	1.39	1.47
14	N	-13	DA	C1'-N9	-5.89	1.39	1.47
16	T	80	DA	C1'-N9	-5.88	1.39	1.47

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
16	T	16	DA	C1'-N9	-5.81	1.39	1.47
16	T	77	DG	C1'-N9	-5.71	1.39	1.47
16	T	62	DA	C1'-N9	-5.71	1.39	1.47
14	N	-12	DA	C1'-N9	-5.66	1.39	1.47
14	N	2	DG	C1'-N9	-5.63	1.39	1.47
14	N	4	DG	C1'-N9	-5.59	1.39	1.47
14	N	-6	DG	C1'-N9	-5.51	1.39	1.47
16	T	58	DG	C1'-N9	-5.51	1.39	1.47
14	N	-90	DG	C1'-N9	-5.50	1.39	1.47
16	T	54	DG	C1'-N9	-5.39	1.39	1.47
14	N	-51	DG	C1'-N9	-5.36	1.39	1.47
14	N	-86	DG	C1'-N9	-5.36	1.39	1.47
14	N	6	DA	C1'-N9	-5.24	1.40	1.47
14	N	-14	DA	C1'-N9	-5.21	1.40	1.47
14	N	-4	DG	C1'-N9	-5.11	1.40	1.47
14	N	-3	DA	C1'-N9	-5.11	1.40	1.47
14	N	-44	DG	C1'-N9	-5.06	1.40	1.47
16	T	3	DT	C1'-N1	5.03	1.55	1.49

All (97) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
30	j	684	ARG	NE-CZ-NH1	9.40	125.00	120.30
30	j	836	ARG	NE-CZ-NH1	9.39	125.00	120.30
16	T	105	DA	N1-C6-N6	-9.10	113.14	118.60
16	T	31	DT	O4'-C1'-N1	9.04	114.32	108.00
15	P	10	U	OP1-P-O3'	8.79	124.55	105.20
16	T	110	DA	N1-C6-N6	-8.75	113.35	118.60
16	T	103	DA	N1-C6-N6	-8.57	113.46	118.60
14	N	-107	DA	N1-C6-N6	-8.44	113.54	118.60
16	T	109	DA	N1-C6-N6	-8.39	113.57	118.60
16	T	114	DA	N1-C6-N6	-7.80	113.92	118.60
14	N	-41	DT	O4'-C1'-N1	7.63	113.34	108.00
16	T	28	DG	O4'-C1'-N9	7.56	113.29	108.00
31	k	287	ARG	NE-CZ-NH2	-7.54	116.53	120.30
16	T	102	DA	C5-C6-N1	7.38	121.39	117.70
16	T	102	DA	N1-C6-N6	-7.33	114.20	118.60
16	T	114	DA	C5-C6-N1	7.24	121.32	117.70
16	T	105	DA	C5-C6-N1	7.23	121.32	117.70
16	T	115	DC	N3-C2-O2	-7.22	116.84	121.90
14	N	-107	DA	C5-C6-N1	7.04	121.22	117.70
15	P	11	U	OP1-P-OP2	-7.04	109.04	119.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
14	N	-113	DC	N3-C2-O2	-7.03	116.98	121.90
16	T	110	DA	C5-C6-N1	7.02	121.21	117.70
16	T	103	DA	C5-C6-N1	6.97	121.19	117.70
16	T	29	DA	O4'-C1'-N9	6.83	112.78	108.00
31	k	287	ARG	NE-CZ-NH1	6.78	123.69	120.30
16	T	101	DC	N3-C2-O2	-6.72	117.20	121.90
14	N	-30	DA	O4'-C1'-N9	6.69	112.68	108.00
16	T	109	DA	C5-C6-N1	6.67	121.04	117.70
16	T	97	DA	O4'-C1'-N9	6.60	112.62	108.00
14	N	-109	DC	O4'-C1'-N1	6.59	112.61	108.00
16	T	105	DA	C4-C5-C6	-6.56	113.72	117.00
16	T	102	DA	C4-C5-C6	-6.51	113.74	117.00
31	k	292	ARG	NE-CZ-NH1	6.49	123.55	120.30
16	T	109	DA	C4-C5-C6	-6.49	113.75	117.00
16	T	39	DA	O4'-C1'-N9	6.44	112.51	108.00
16	T	110	DA	C4-C5-C6	-6.38	113.81	117.00
14	N	-102	DT	O4'-C1'-N1	6.35	112.44	108.00
16	T	111	DT	O4'-C1'-N1	6.34	112.44	108.00
16	T	99	DC	O4'-C1'-N1	6.34	112.44	108.00
14	N	-105	DC	N3-C2-O2	-6.32	117.48	121.90
14	N	-107	DA	C4-C5-C6	-6.31	113.85	117.00
16	T	103	DA	C4-C5-C6	-6.24	113.88	117.00
16	T	114	DA	C4-C5-C6	-6.23	113.89	117.00
26	e	116	ARG	NE-CZ-NH1	6.12	123.36	120.30
14	N	-104	DT	C6-C5-C7	-6.07	119.26	122.90
16	T	111	DT	C6-C5-C7	-6.00	119.30	122.90
16	T	107	DC	N3-C2-O2	-5.99	117.71	121.90
16	T	108	DT	C6-C5-C7	-5.92	119.35	122.90
14	N	-106	DT	C6-C5-C7	-5.90	119.36	122.90
27	f	45	ARG	NE-CZ-NH1	5.89	123.25	120.30
16	T	112	DT	P-O3'-C3'	5.83	126.69	119.70
23	u	273	ARG	NE-CZ-NH1	5.82	123.21	120.30
14	N	-97	DT	O4'-C1'-N1	5.82	112.07	108.00
31	k	302	ARG	NE-CZ-NH1	5.80	123.20	120.30
14	N	-103	DT	C6-C5-C7	-5.76	119.44	122.90
16	T	112	DT	C6-C5-C7	-5.72	119.47	122.90
14	N	-100	DT	N3-C2-O2	-5.67	118.90	122.30
2	B	433	ARG	NE-CZ-NH1	5.67	123.13	120.30
14	N	-113	DC	N1-C2-O2	5.66	122.30	118.90
16	T	104	DG	N1-C6-O6	-5.65	116.51	119.90
14	N	-111	DG	N1-C6-O6	-5.65	116.51	119.90
14	N	-114	DT	C6-C5-C7	-5.62	119.53	122.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
14	N	-112	DT	C6-C5-C7	-5.58	119.55	122.90
16	T	103	DA	O4'-C1'-N9	5.55	111.89	108.00
14	N	-104	DT	N3-C2-O2	-5.55	118.97	122.30
14	N	-103	DT	N3-C2-O2	-5.55	118.97	122.30
16	T	112	DT	N3-C2-O2	-5.53	118.98	122.30
31	k	264	ARG	NE-CZ-NH1	5.51	123.06	120.30
16	T	115	DC	N1-C2-O2	5.50	122.20	118.90
14	N	-110	DG	N1-C6-O6	-5.49	116.61	119.90
14	N	-108	DC	N3-C2-O2	-5.47	118.07	121.90
31	k	58	ARG	NE-CZ-NH1	5.38	122.99	120.30
31	k	270	ARG	NE-CZ-NH1	5.36	122.98	120.30
16	T	111	DT	N3-C2-O2	-5.33	119.10	122.30
30	j	817	ARG	NE-CZ-NH1	5.30	122.95	120.30
2	B	427	ARG	NE-CZ-NH1	5.29	122.94	120.30
23	u	271	ARG	NE-CZ-NH1	5.28	122.94	120.30
14	N	-109	DC	N3-C2-O2	-5.27	118.21	121.90
14	N	-112	DT	N3-C2-O2	-5.26	119.14	122.30
14	N	-106	DT	N3-C2-O2	-5.26	119.14	122.30
16	T	106	DG	C5-C6-N1	5.23	114.12	111.50
16	T	94	DC	P-O3'-C3'	5.22	125.97	119.70
14	N	-100	DT	C6-C5-C7	-5.22	119.77	122.90
30	j	616	ARG	NE-CZ-NH1	5.21	122.91	120.30
28	g	77	ARG	NE-CZ-NH1	5.21	122.90	120.30
14	N	-81	DG	C3'-C2'-C1'	-5.16	96.31	102.50
14	N	-102	DT	C6-C5-C7	-5.14	119.82	122.90
14	N	-44	DG	O4'-C1'-N9	5.11	111.58	108.00
31	k	129	ARG	NE-CZ-NH1	5.09	122.85	120.30
14	N	-105	DC	N1-C2-O2	5.09	121.95	118.90
14	N	-106	DT	O4'-C1'-N1	5.08	111.56	108.00
14	N	-43	DT	O4'-C1'-N1	5.05	111.54	108.00
16	T	105	DA	O4'-C1'-N9	5.04	111.53	108.00
31	k	5	ASP	CB-CG-OD2	-5.03	113.78	118.30
14	N	-109	DC	C1'-O4'-C4'	-5.02	105.08	110.10
14	N	-108	DC	N3-C4-C5	5.02	123.91	121.90
16	T	31	DT	C1'-O4'-C4'	-5.01	105.09	110.10

There are no chirality outliers.

All (10) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
14	N	-101	DG	Sidechain
14	N	-102	DT	Sidechain

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Mol	Chain	Res	Type	Group
14	N	-108	DC	Sidechain
14	N	-111	DG	Sidechain
14	N	-114	DT	Sidechain
16	T	103	DA	Sidechain
16	T	112	DT	Sidechain
30	j	616	ARG	Sidechain
31	k	292	ARG	Sidechain
31	k	58	ARG	Sidechain

## 5.2 Too-close contacts [i](#)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

## 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%)	1354 (97%)	37 (3%)	1 (0%)	51	84
2	B	1154/1227 (94%)	1117 (97%)	37 (3%)	0	100	100
3	C	261/304 (86%)	259 (99%)	2 (1%)	0	100	100
4	D	170/186 (91%)	166 (98%)	4 (2%)	0	100	100
5	E	211/214 (99%)	205 (97%)	6 (3%)	0	100	100
6	F	82/155 (53%)	80 (98%)	2 (2%)	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%)	107 (98%)	2 (2%)	0	100	100
10	J	65/72 (90%)	65 (100%)	0	0	100	100
11	K	111/118 (94%)	110 (99%)	1 (1%)	0	100	100
12	L	43/72 (60%)	41 (95%)	2 (5%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
13	M	62/113 (55%)	62 (100%)	0	0	100	100
17	V	104/108 (96%)	100 (96%)	4 (4%)	0	100	100
18	W	527/911 (58%)	506 (96%)	21 (4%)	0	100	100
19	m	1179/1503 (78%)	1157 (98%)	22 (2%)	0	100	100
20	n	137/417 (33%)	136 (99%)	1 (1%)	0	100	100
21	q	928/1084 (86%)	922 (99%)	6 (1%)	0	100	100
22	r	260/544 (48%)	254 (98%)	6 (2%)	0	100	100
23	u	206/459 (45%)	204 (99%)	2 (1%)	0	100	100
24	v	341/396 (86%)	327 (96%)	14 (4%)	0	100	100
25	x	201/395 (51%)	200 (100%)	1 (0%)	0	100	100
26	a	74/139 (53%)	70 (95%)	4 (5%)	0	100	100
26	e	88/139 (63%)	87 (99%)	1 (1%)	0	100	100
27	b	81/106 (76%)	78 (96%)	3 (4%)	0	100	100
27	f	76/106 (72%)	73 (96%)	3 (4%)	0	100	100
28	c	101/133 (76%)	100 (99%)	1 (1%)	0	100	100
28	g	68/133 (51%)	66 (97%)	2 (3%)	0	100	100
29	d	93/129 (72%)	89 (96%)	4 (4%)	0	100	100
29	h	91/129 (70%)	90 (99%)	1 (1%)	0	100	100
30	j	462/1008 (46%)	449 (97%)	12 (3%)	1 (0%)	47	79
31	k	423/531 (80%)	411 (97%)	12 (3%)	0	100	100
All	All	9398/13005 (72%)	9176 (98%)	220 (2%)	2 (0%)	100	100

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	960	VAL
30	j	543	LYS

### 5.3.2 Protein sidechains [i](#)

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%)	1216 (100%)	3 (0%)	93	96
2	B	1018/1077 (94%)	1016 (100%)	2 (0%)	93	96
3	C	236/264 (89%)	236 (100%)	0	100	100
4	D	149/160 (93%)	149 (100%)	0	100	100
5	E	196/197 (100%)	194 (99%)	2 (1%)	76	86
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
13	M	61/99 (62%)	60 (98%)	1 (2%)	62	79
17	V	90/92 (98%)	90 (100%)	0	100	100
18	W	480/796 (60%)	480 (100%)	0	100	100
19	m	1087/1354 (80%)	1086 (100%)	1 (0%)	93	97
20	n	125/361 (35%)	125 (100%)	0	100	100
21	q	824/962 (86%)	824 (100%)	0	100	100
22	r	239/485 (49%)	239 (100%)	0	100	100
23	u	192/406 (47%)	191 (100%)	1 (0%)	88	93
24	v	325/369 (88%)	325 (100%)	0	100	100
25	x	190/354 (54%)	190 (100%)	0	100	100
26	a	64/112 (57%)	64 (100%)	0	100	100
26	e	77/112 (69%)	77 (100%)	0	100	100
27	b	68/81 (84%)	68 (100%)	0	100	100
27	f	63/81 (78%)	63 (100%)	0	100	100
28	c	82/102 (80%)	82 (100%)	0	100	100
28	g	54/102 (53%)	54 (100%)	0	100	100
29	d	81/107 (76%)	81 (100%)	0	100	100
29	h	79/107 (74%)	79 (100%)	0	100	100
30	j	417/910 (46%)	417 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
31	k	392/474 (83%)	392 (100%)	0	100	100
All	All	8460/11447 (74%)	8450 (100%)	10 (0%)	93	97

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	408	ARG
1	A	831	LYS
1	A	1302	LYS
2	B	463	LYS
2	B	904	ARG
5	E	36	GLN
5	E	166	ARG
13	M	40	LYS
19	m	514	LYS
23	u	124	ARG

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

Mol	Chain	Res	Type
1	A	737	ASN
8	H	44	ASN
9	I	11	ASN
18	W	644	ASN
19	m	955	ASN
20	n	232	GLN
21	q	147	ASN
25	x	296	ASN
27	b	25	ASN
28	c	73	ASN
30	j	750	GLN
31	k	127	ASN
31	k	141	ASN

### 5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
15	P	19/19 (100%)	10 (52%)	1 (5%)

All (10) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
15	P	-6	G
15	P	-5	U
15	P	-4	A
15	P	-3	A
15	P	-2	U
15	P	0	C
15	P	1	C
15	P	8	G
15	P	9	G
15	P	11	U

All (1) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
15	P	-7	U

## 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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 11 ligands modelled in this entry, 11 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.



## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

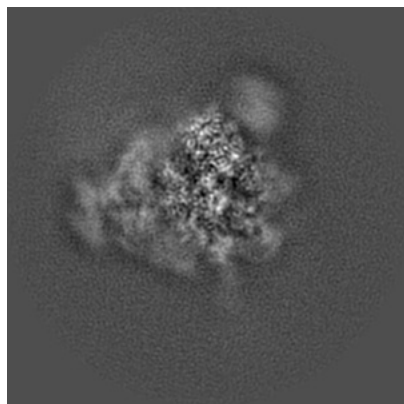
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-33447. These allow visual inspection of the internal detail of the map and identification of artifacts.

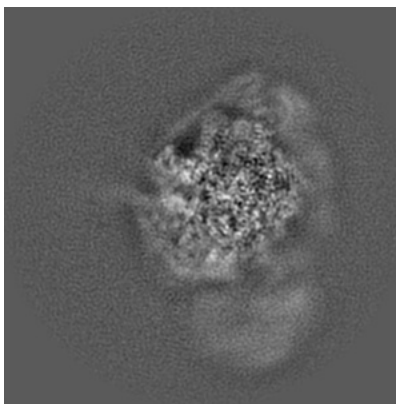
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

### 6.1 Orthogonal projections [i](#)

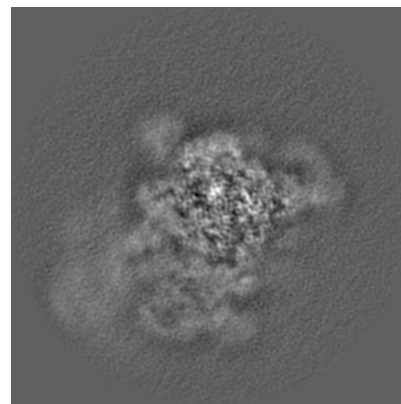
#### 6.1.1 Primary map



X

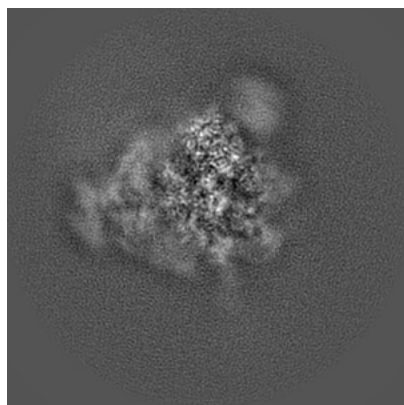


Y

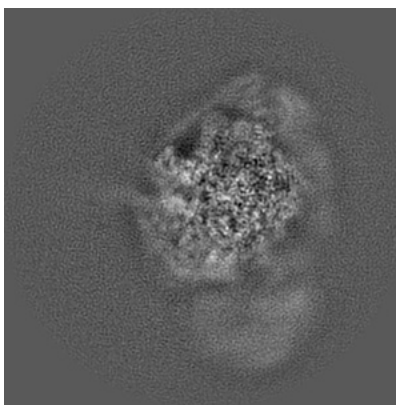


Z

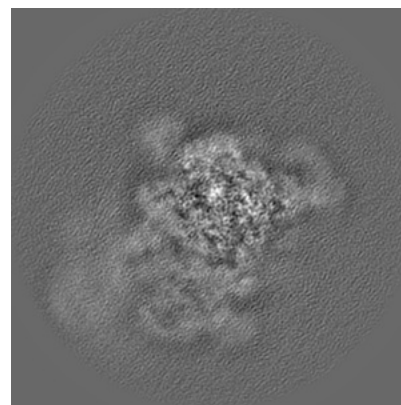
#### 6.1.2 Raw map



X



Y

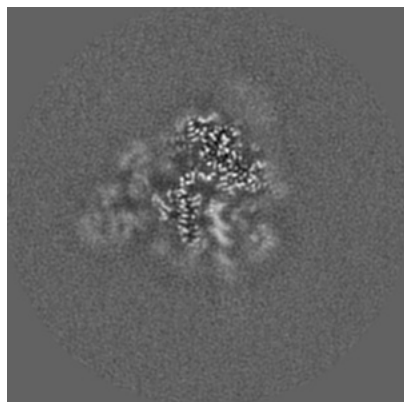


Z

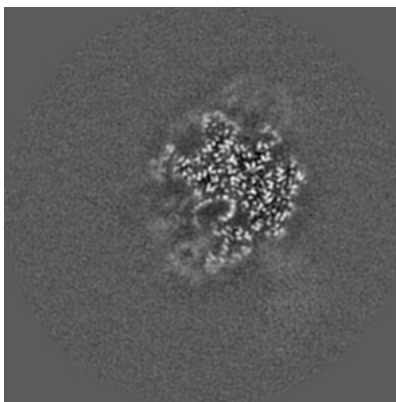
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

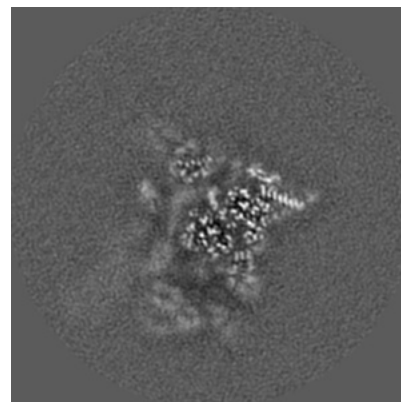
### 6.2.1 Primary map



X Index: 120

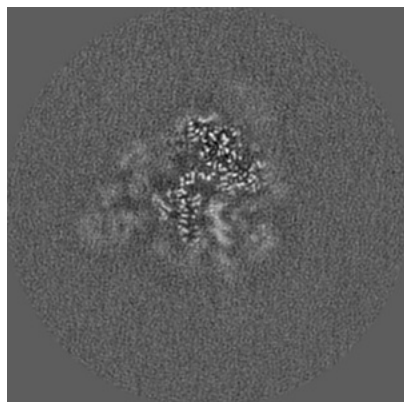


Y Index: 120

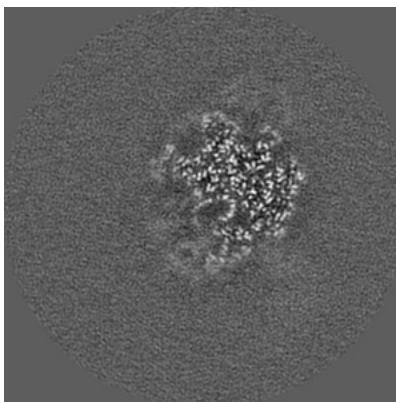


Z Index: 120

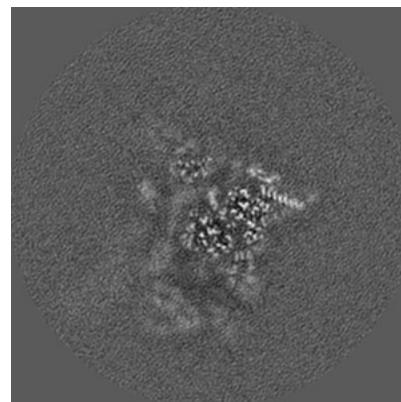
### 6.2.2 Raw map



X Index: 120



Y Index: 120

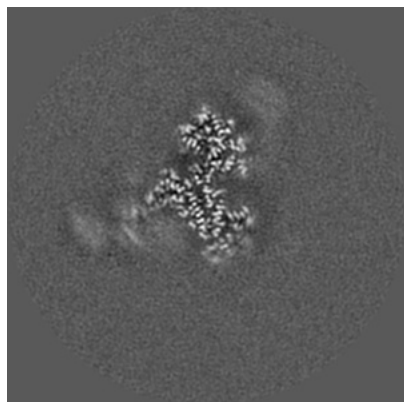


Z Index: 120

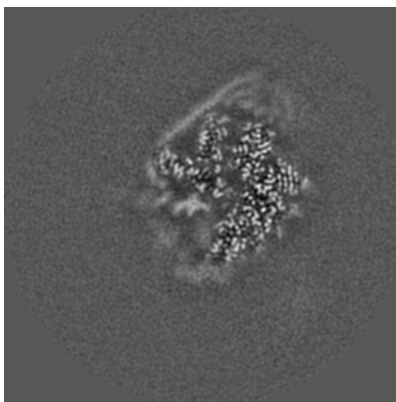
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices [i](#)

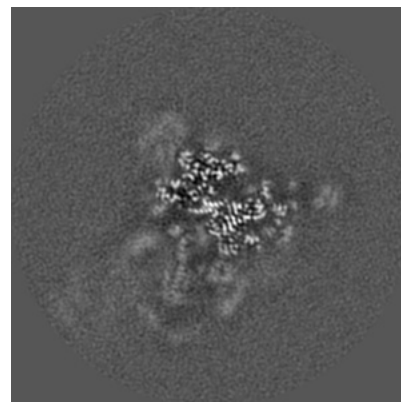
### 6.3.1 Primary map



X Index: 141

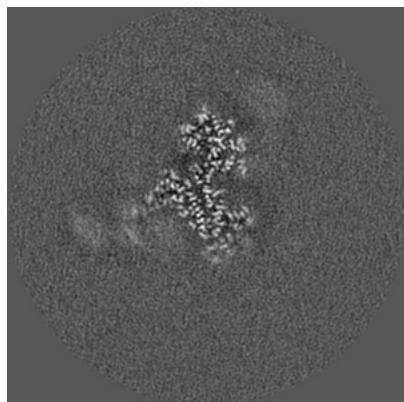


Y Index: 125

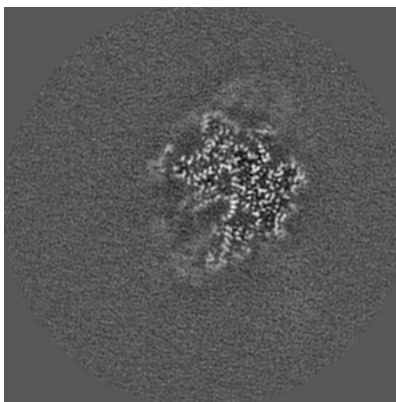


Z Index: 137

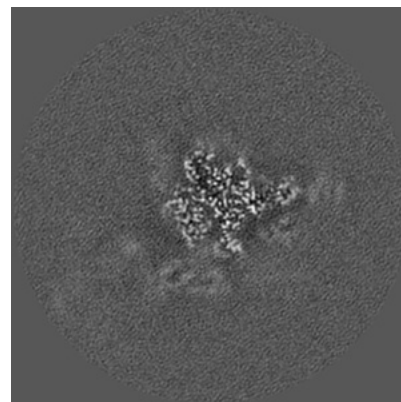
### 6.3.2 Raw map



X Index: 141



Y Index: 121

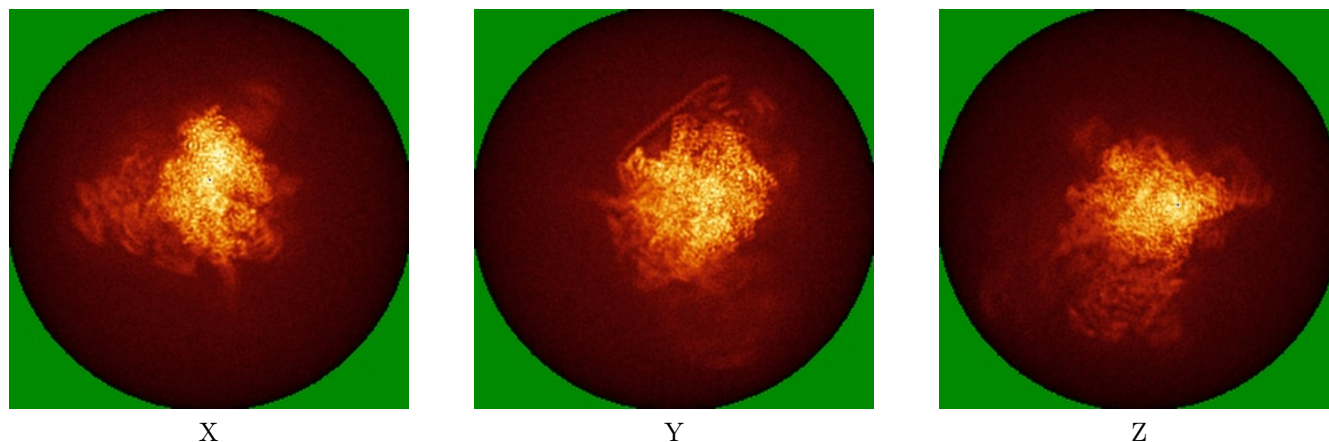


Z Index: 146

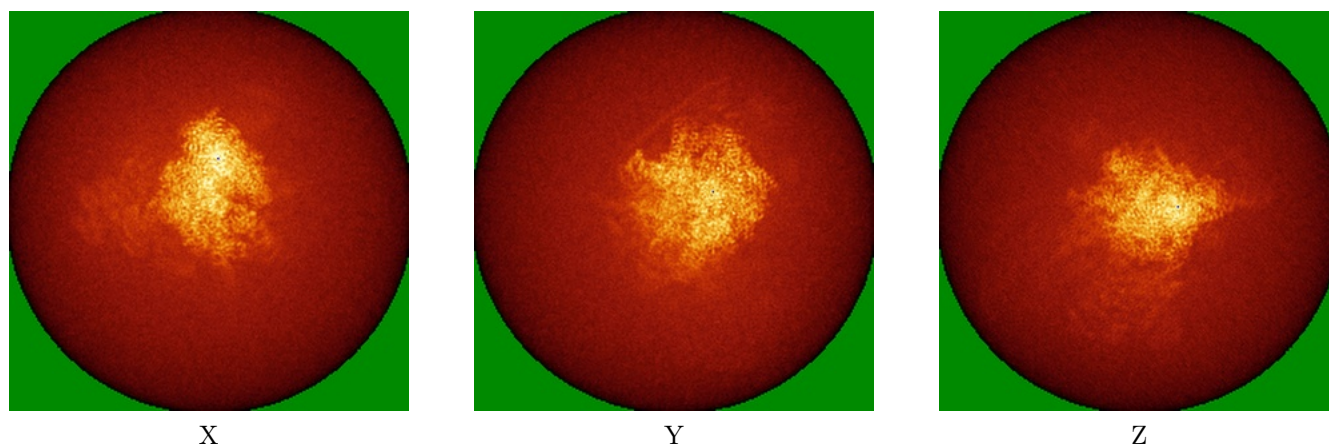
The images above show the largest variance slices of the map in three orthogonal directions.

## 6.4 Orthogonal standard-deviation projections (False-color) [i](#)

### 6.4.1 Primary map



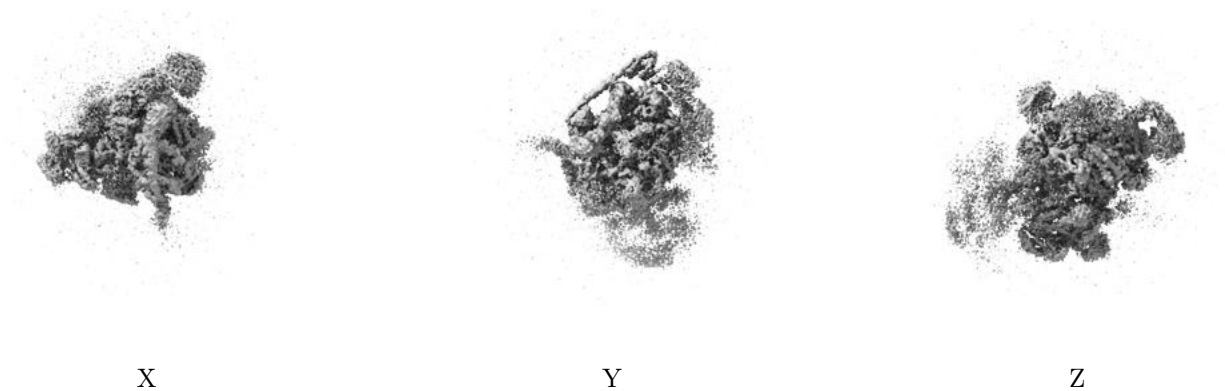
### 6.4.2 Raw map



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.

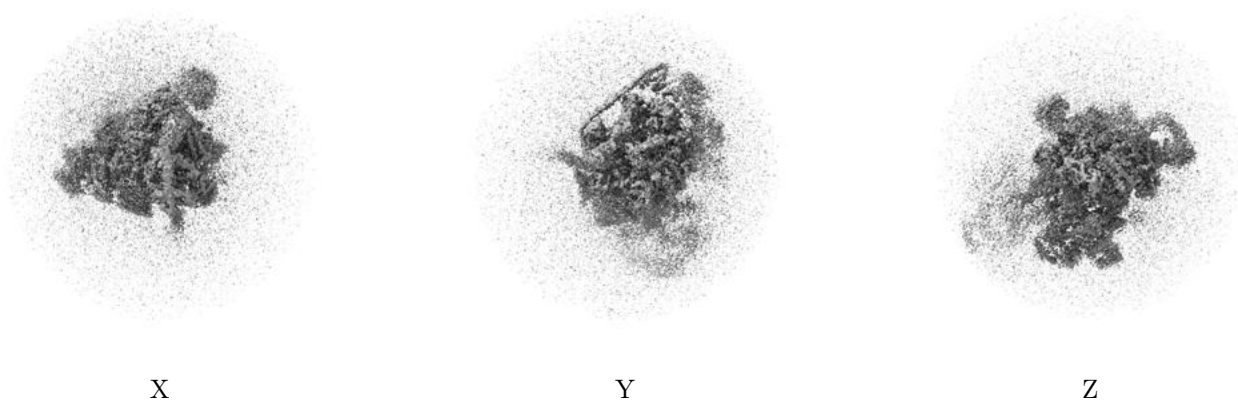
## 6.5 Orthogonal surface views [i](#)

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.009. 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



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.

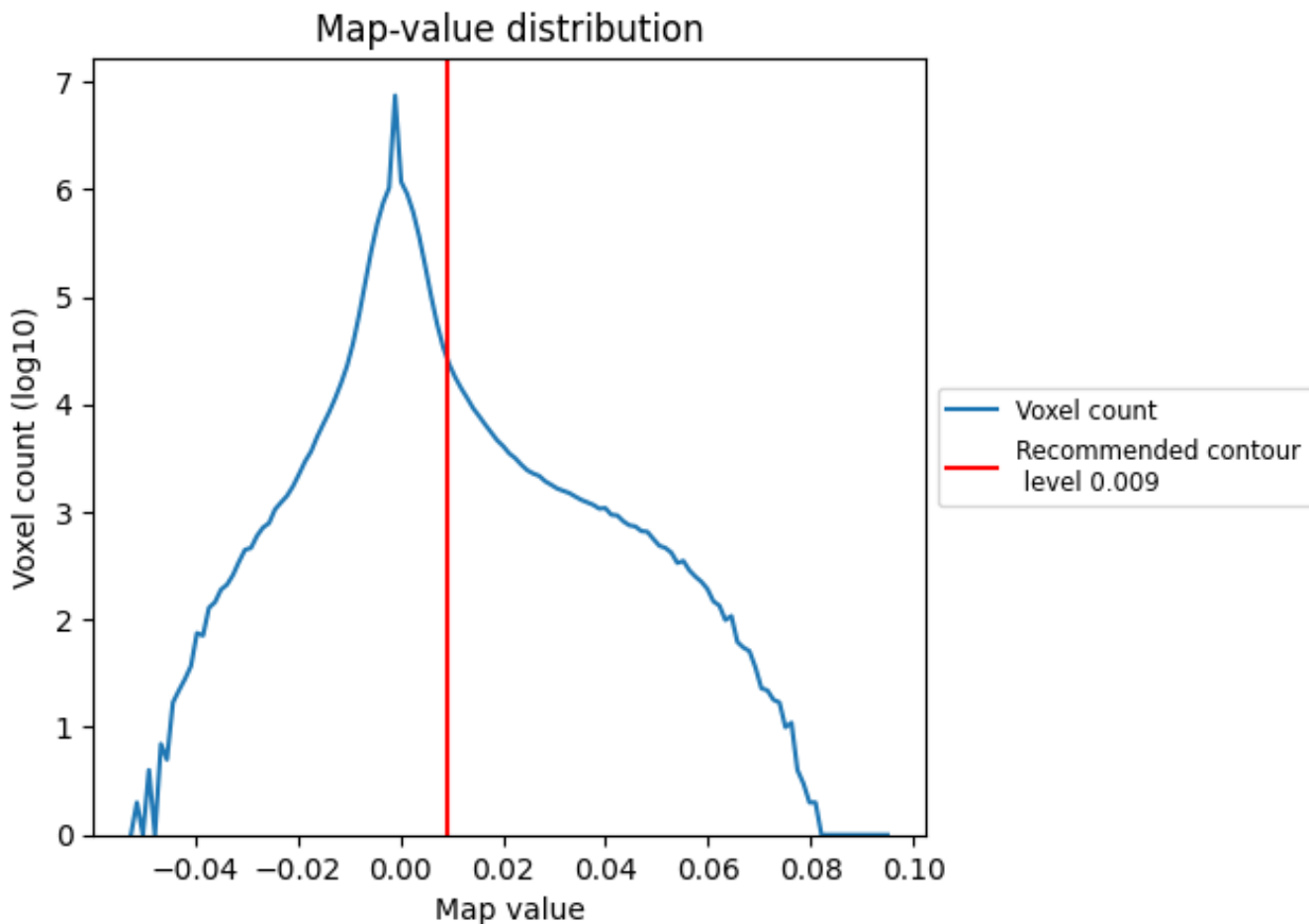
## 6.6 Mask visualisation [i](#)

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

## 7 Map analysis [i](#)

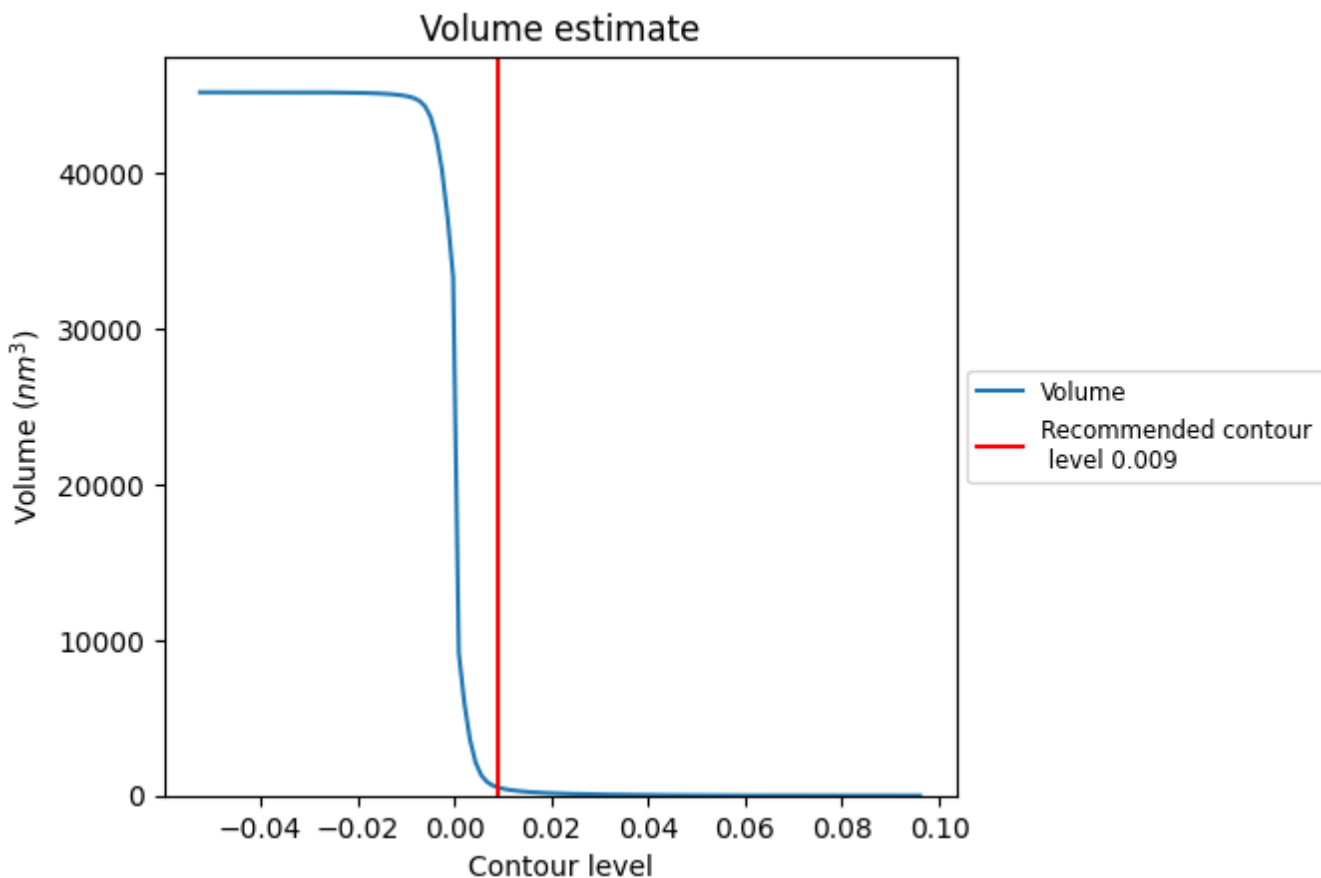
This section contains the results of statistical analysis of the map.

### 7.1 Map-value distribution [i](#)



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 [i](#)

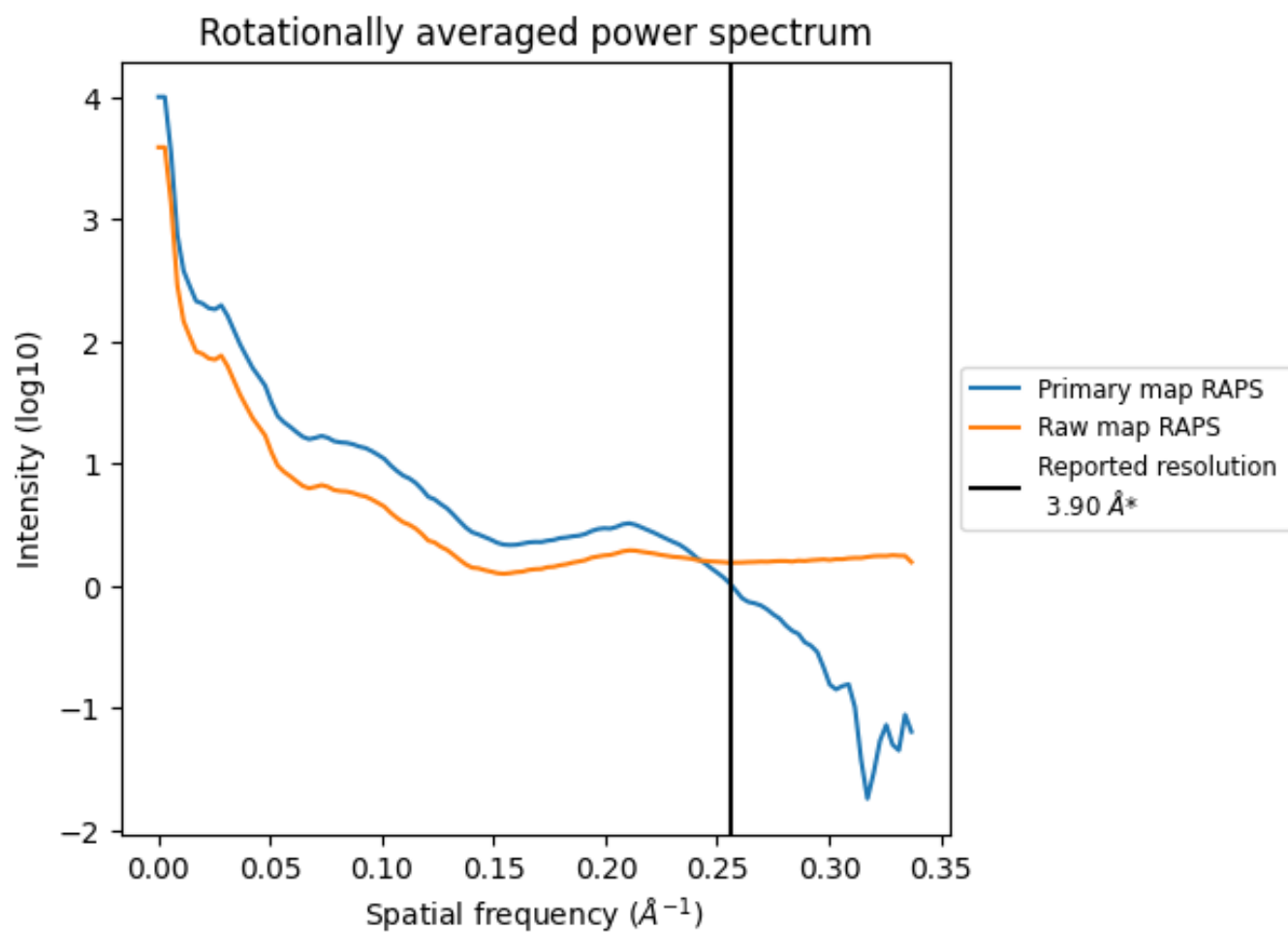


The volume at the recommended contour level is 526 nm<sup>3</sup>; this corresponds to an approximate mass of 475 kDa.

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



### 7.3 Rotationally averaged power spectrum i

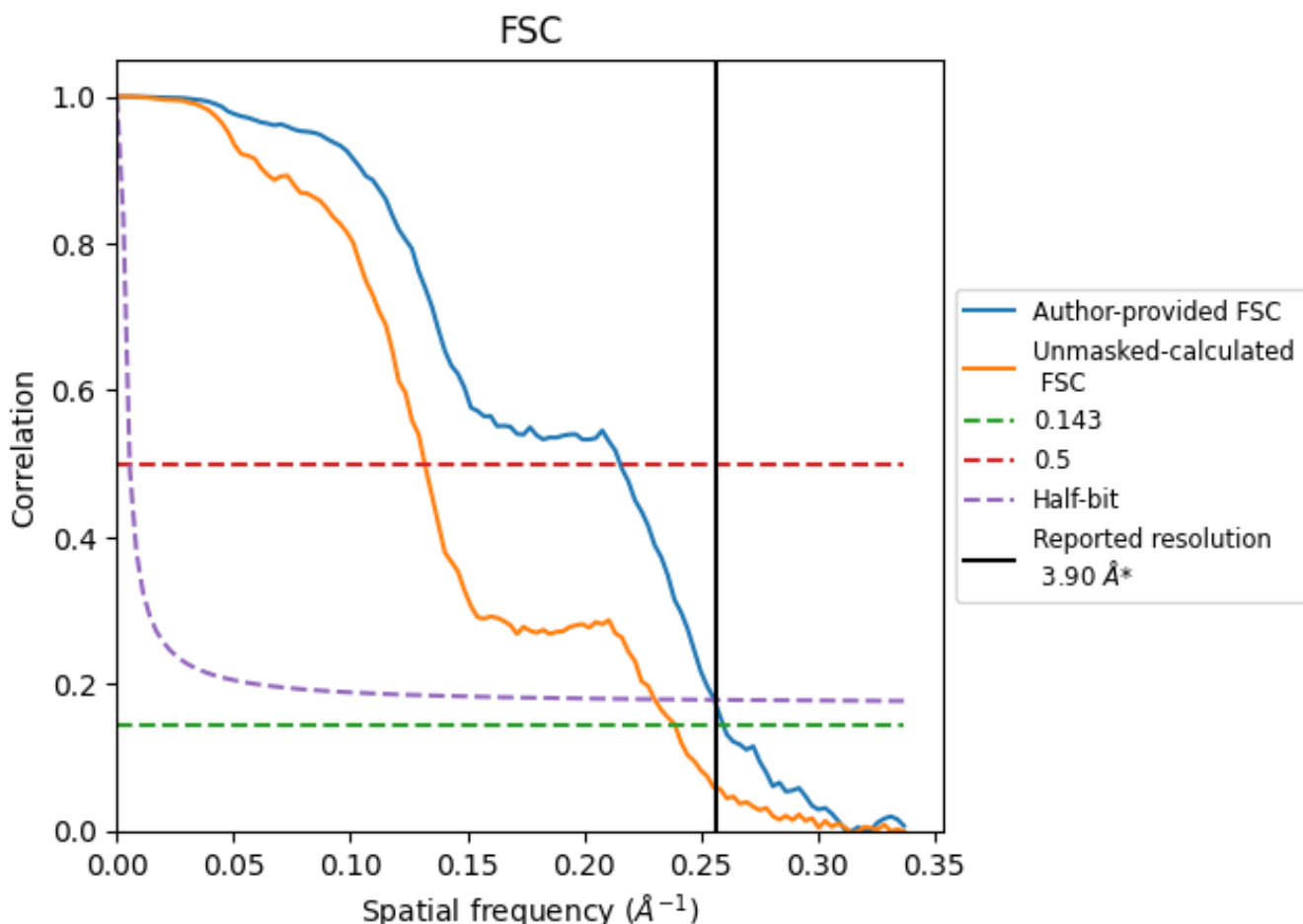


\*Reported resolution corresponds to spatial frequency of 0.256 Å<sup>-1</sup>

## 8 Fourier-Shell correlation [i](#)

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 [i](#)



\*Reported resolution corresponds to spatial frequency of 0.256 Å<sup>-1</sup>

## 8.2 Resolution estimates [i](#)

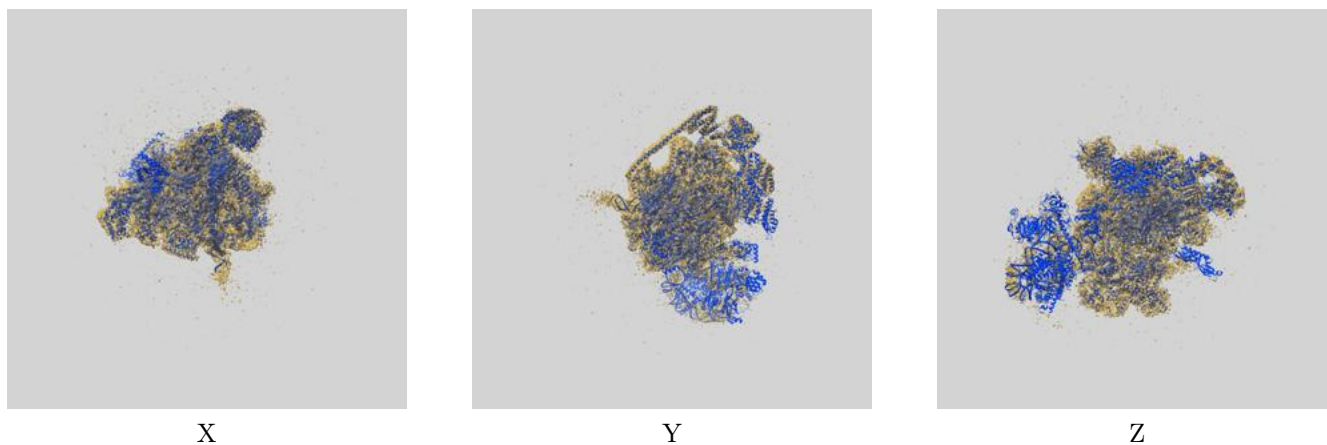
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.90	-	-
Author-provided FSC curve	3.85	4.64	3.91
Unmasked-calculated*	4.19	7.59	4.34

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

## 9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-33447 and PDB model 7XTD. Per-residue inclusion information can be found in section 3 on page 16.

### 9.1 Map-model overlay [i](#)



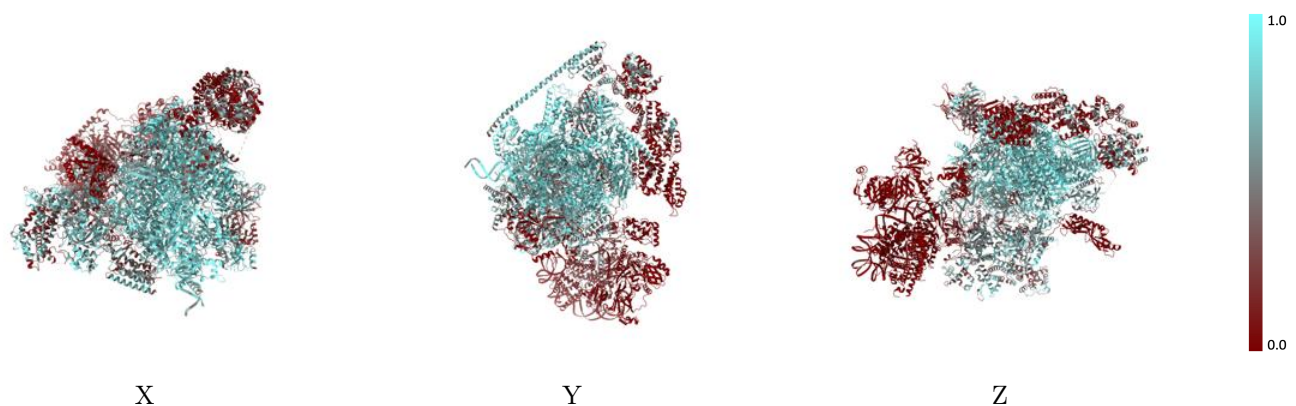
The images above show the 3D surface view of the map at the recommended contour level 0.009 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

## 9.2 Q-score mapped to coordinate model [i](#)



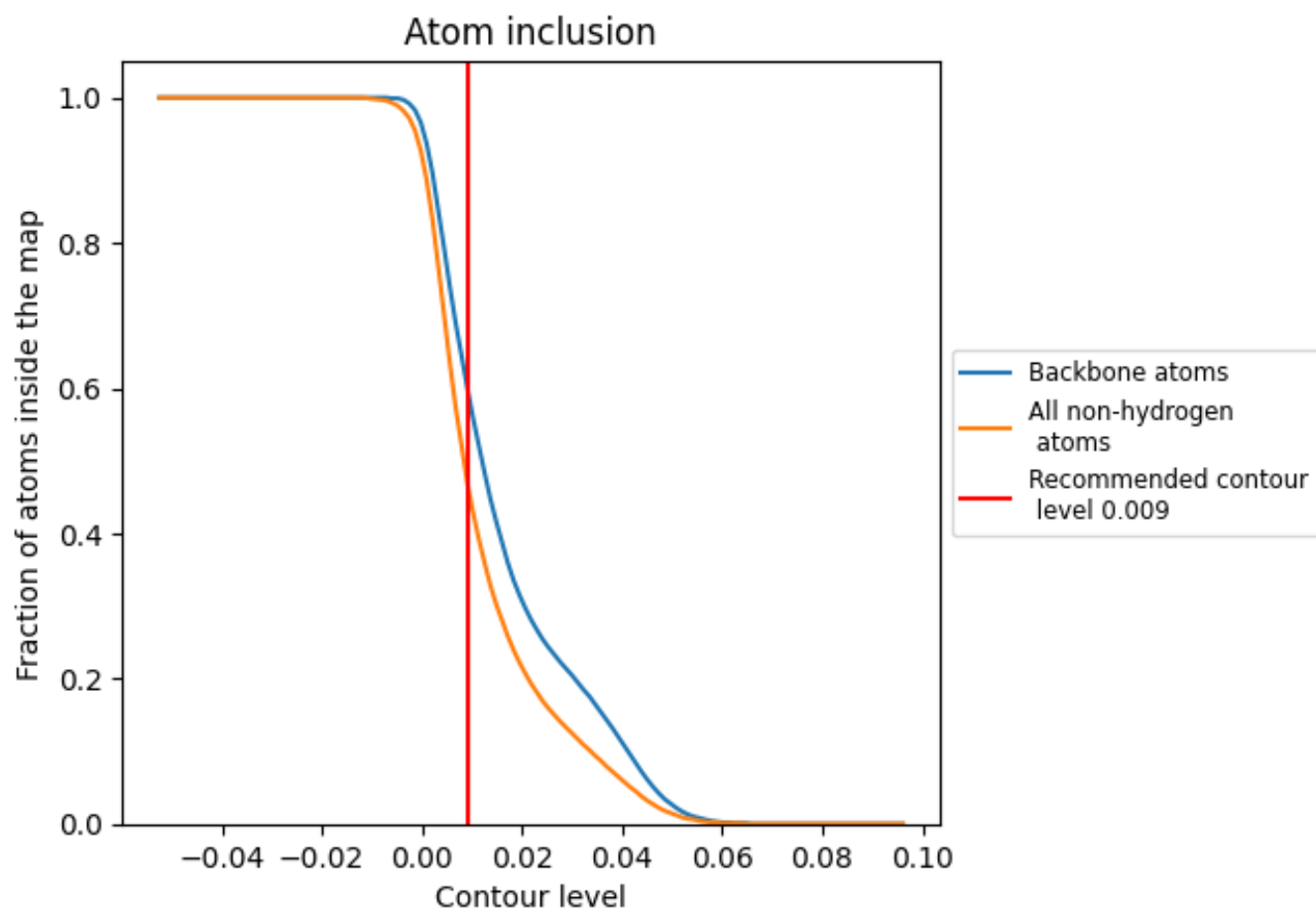
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

## 9.3 Atom inclusion mapped to coordinate model [i](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.009).









































































## 9.4 Atom inclusion [i](#)



At the recommended contour level, 60% of all backbone atoms, 47% 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 (0.009) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.4720	 0.2210
A	 0.8070	 0.4220
B	 0.7830	 0.4370
C	 0.8350	 0.4550
D	 0.5840	 0.2180
E	 0.8350	 0.4030
F	 0.8500	 0.4680
G	 0.6570	 0.3200
H	 0.8420	 0.4480
I	 0.5620	 0.2560
J	 0.8260	 0.4530
K	 0.8580	 0.4640
L	 0.7900	 0.4030
M	 0.4520	 0.1740
N	 0.3410	 0.0870
P	 0.7520	 0.3230
T	 0.3710	 0.1150
V	 0.5460	 0.1410
W	 0.4460	 0.2030
a	 0.0440	 0.0430
b	 0.0130	 0.0010
c	 0.0060	 0.0020
d	 0.0190	 0.0010
e	 0.0280	 0.0190
f	 0.0290	 -0.0230
g	 0.0040	 0.0030
h	 0.0040	 0.0010
j	 0.0480	 0.0270
k	 0.0060	 0.0010
m	 0.4210	 0.1310
n	 0.4850	 0.1470
q	 0.2850	 0.0790
r	 0.2050	 0.0950
u	 0.3130	 0.1560
v	 0.2020	 0.0990
x	 0.4440	 0.2670

