



## Full wwPDB EM Validation Report ⓘ

Mar 13, 2024 – 07:23 PM JST

PDB ID : 5WSG  
EMDB ID : EMD-6684  
Title : Cryo-EM structure of the Catalytic Step II spliceosome (C\* complex) at 4.0 angstrom resolution  
Authors : Yan, C.; Wan, R.; Bai, R.; Huang, G.; Shi, Y.  
Deposited on : 2016-12-07  
Resolution : 4.00 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:

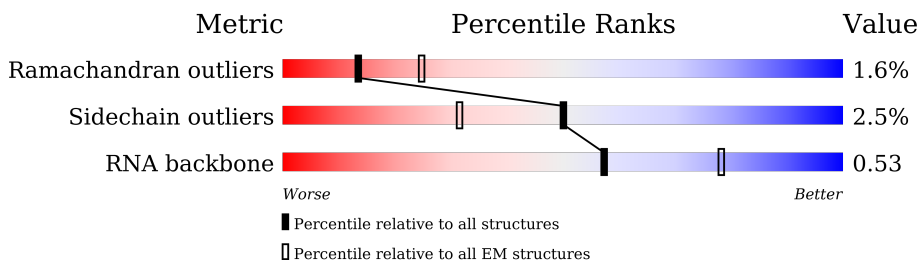
EMDB validation analysis : 0.0.1.dev70  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

# 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 4.00 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.



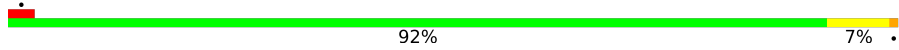



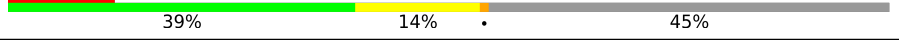

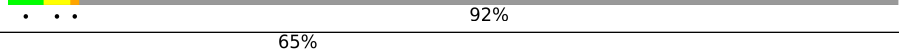
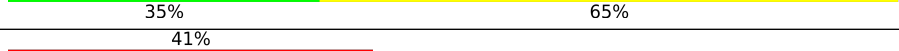
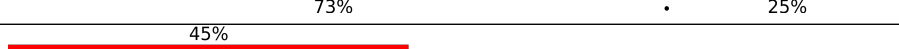
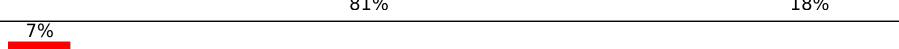















Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826
RNA backbone	4643	859

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	2413	
2	C	1008	
3	J	135	
4	O	451	
5	P	379	
6	Q	364	
7	R	339	
8	S	175	

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Mol	Chain	Length	Quality of chain
9	T	157	
10	Z	577	
11	B	13	
12	N	15	
13	D	214	
14	E	112	
15	L	1175	
16	M	23	
17	c	579	
18	d	652	
19	I	215	
20	v	858	
21	n	455	
22	o	503	
22	p	503	
22	q	503	
22	r	503	
23	t	175	
24	F	196	
24	k	196	
25	G	94	
25	i	94	
26	H	86	
26	h	86	
27	K	77	

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Mol	Chain	Length	Quality of chain
27	j	77	<p>73% 86% 10%</p>
28	U	101	<p>81% 77% 19%</p>
28	l	101	<p>48% 77% 19%</p>
29	V	146	<p>56% 52% 44%</p>
29	m	146	<p>52% 52% 44%</p>
30	W	110	<p>59% 54% 41%</p>
30	g	110	<p>75% 79% 5% 15%</p>
31	X	111	<p>73% 68% 5% 27%</p>
32	Y	238	<p>57% 48% 7% 43%</p>
33	b	14	<p>14% 71% 86%</p>
34	e	1071	<p>63% 58% 5% 37%</p>
35	f	251	<p>55% 58% 41%</p>

## 2 Entry composition i

There are 38 unique types of molecules in this entry. The entry contains 76730 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 Pre-mRNA-splicing factor 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	1931	15939	10244	2739	2898	58	0	0

- Molecule 2 is a protein called Pre-mRNA-splicing factor SNU114.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	C	878	7019	4529	1166	1295	29	0	0

- Molecule 3 is a protein called Pre-mRNA-splicing factor CWC21.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
3	J	27	190	112	38	40	0	0

- Molecule 4 is a protein called Pre-mRNA-splicing factor PRP46.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	O	337	2646	1669	466	501	10	0	0

- Molecule 5 is a protein called Pre-mRNA-processing protein 45.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	P	201	1583	988	290	298	7	0	0

- Molecule 6 is a protein called Pre-mRNA-splicing factor SLT11.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	Q	185	1472	930	256	271	15	0	0

- Molecule 7 is a protein called Pre-mRNA-splicing factor CWC2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	R	261	2089	1320	369	388	12	0	0

- Molecule 8 is a protein called Pre-mRNA-splicing factor CWC15.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
8	S	69	560	351	112	96	1	0	0

- Molecule 9 is a protein called Pre-mRNA-splicing factor BUD31.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	T	157	1291	808	240	232	11	0	0

- Molecule 10 is a protein called Pre-mRNA-splicing factor CWC22.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
10	Z	447	3651	2343	602	688	18	0	0

- Molecule 11 is a RNA chain called 5'-exon.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
11	B	13	275	124	47	91	13	0	0

- Molecule 12 is a RNA chain called 5'-intron-lariat.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
12	N	15	312	140	45	112	15	0	0

- Molecule 13 is a RNA chain called U5 snRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
13	D	117	2465	1104	414	830	117	0	0

- Molecule 14 is a RNA chain called *Saccharomyces cerevisiae* S288c SNR6 snRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
14	E	103	2192	982	391	716	103	0	0

- Molecule 15 is a RNA chain called RNA (91-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
15	L	91	1909	854	309	655	91	0	0

- Molecule 16 is a RNA chain called 3'-intron-lariat.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
16	M	23	486	219	86	158	23	0	0

- Molecule 17 is a protein called Pre-mRNA-splicing factor CEF1,Pre-mRNA-splicing factor CEF1,Cef1,Pre-mRNA-splicing factor CEF1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
17	c	436	2971	1841	549	573	8	0	0

- Molecule 18 is a protein called Pre-mRNA-splicing factor CLF1,Pre-mRNA-splicing factor CLF1,Clf1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
18	d	532	3506	2182	658	658	8	0	0

- Molecule 19 is a protein called Pre-mRNA-splicing factor SYF2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
19	I	102	822	504	152	165	1	0	0

- Molecule 20 is a protein called Syf1,Pre-mRNA-splicing factor SYF1,Syf1,Pre-mRNA-splicing factor SYF1,Syf1,Pre-mRNA-splicing factor SYF1,Syf1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
20	v	593	3183	1953	603	626	1	0	0

- Molecule 21 is a protein called Pre-mRNA-processing factor 17.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
21	n	296	1870	1162	337	365	6	0	0

- Molecule 22 is a protein called Pre-mRNA-processing factor 19.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
22	o	126	830	525	134	169	2	0	0
22	p	128	843	532	136	173	2	0	0
22	q	387	2345	1471	402	464	8	0	0
22	r	125	823	521	133	167	2	0	0

- Molecule 23 is a protein called Pre-mRNA-splicing factor SNT309.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
23	t	156	926	585	160	180	1	0	0

- Molecule 24 is a protein called Small nuclear ribonucleoprotein-associated protein B.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
24	k	80	631	403	114	111	3	0	0
24	F	78	610	389	110	108	3	0	0

- Molecule 25 is a protein called Small nuclear ribonucleoprotein E.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
25	i	75	575	379	92	101	3	0	0
25	G	75	575	379	92	101	3	0	0

- Molecule 26 is a protein called Small nuclear ribonucleoprotein F.



Mol	Chain	Residues	Atoms					AltConf	Trace
26	h	70	Total	C	N	O	S	0	0
			554	355	98	100	1		
26	H	70	Total	C	N	O	S	0	0
			554	355	98	100	1		

- Molecule 27 is a protein called Small nuclear ribonucleoprotein G.

Mol	Chain	Residues	Atoms					AltConf	Trace
27	j	69	Total	C	N	O	S	0	0
			529	337	93	97	2		
27	K	69	Total	C	N	O	S	0	0
			529	337	93	97	2		

- Molecule 28 is a protein called Small nuclear ribonucleoprotein Sm D3.

Mol	Chain	Residues	Atoms					AltConf	Trace
28	l	82	Total	C	N	O	S	0	0
			625	399	109	115	2		
28	U	82	Total	C	N	O	S	0	0
			625	399	109	115	2		

- Molecule 29 is a protein called Small nuclear ribonucleoprotein Sm D1.

Mol	Chain	Residues	Atoms					AltConf	Trace
29	m	82	Total	C	N	O	S	0	0
			644	409	110	123	2		
29	V	82	Total	C	N	O	S	0	0
			644	409	110	123	2		

- Molecule 30 is a protein called Small nuclear ribonucleoprotein Sm D2.

Mol	Chain	Residues	Atoms					AltConf	Trace
30	g	94	Total	C	N	O	S	0	0
			741	477	141	119	4		
30	W	65	Total	C	N	O	S	0	0
			528	340	102	84	2		

- Molecule 31 is a protein called U2 small nuclear ribonucleoprotein B'.

Mol	Chain	Residues	Atoms				AltConf	Trace
31	X	81	Total	C	N	O	0	0
			513	332	89	92		

- Molecule 32 is a protein called U2 small nuclear ribonucleoprotein A'.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
32	Y	135	841	538	142	161	0	0

- Molecule 33 is a RNA chain called 3'-exon-intron.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
33	b	14	208	91	13	90	14	0	0

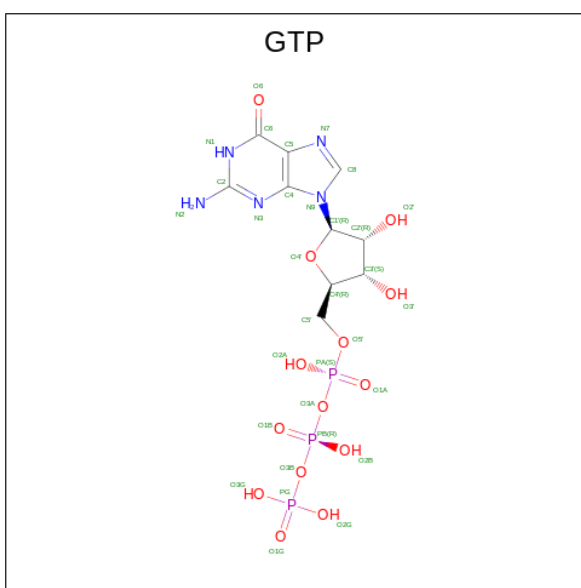
- Molecule 34 is a protein called Pre-mRNA-splicing factor ATP-dependent RNA helicase PRP16.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
34	e	679	3360	2002	679	679	0	0

- Molecule 35 is a protein called Pre-mRNA-splicing factor 18.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
35	f	148	1202	780	204	214	4	0	0

- Molecule 36 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GTP) (formula: C<sub>10</sub>H<sub>16</sub>N<sub>5</sub>O<sub>14</sub>P<sub>3</sub>).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
36	C	1	32	10	5	14	3	0

- Molecule 37 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
			Total	Mg	
37	C	1	1	1	0
37	B	1	1	1	0
37	E	4	4	4	0

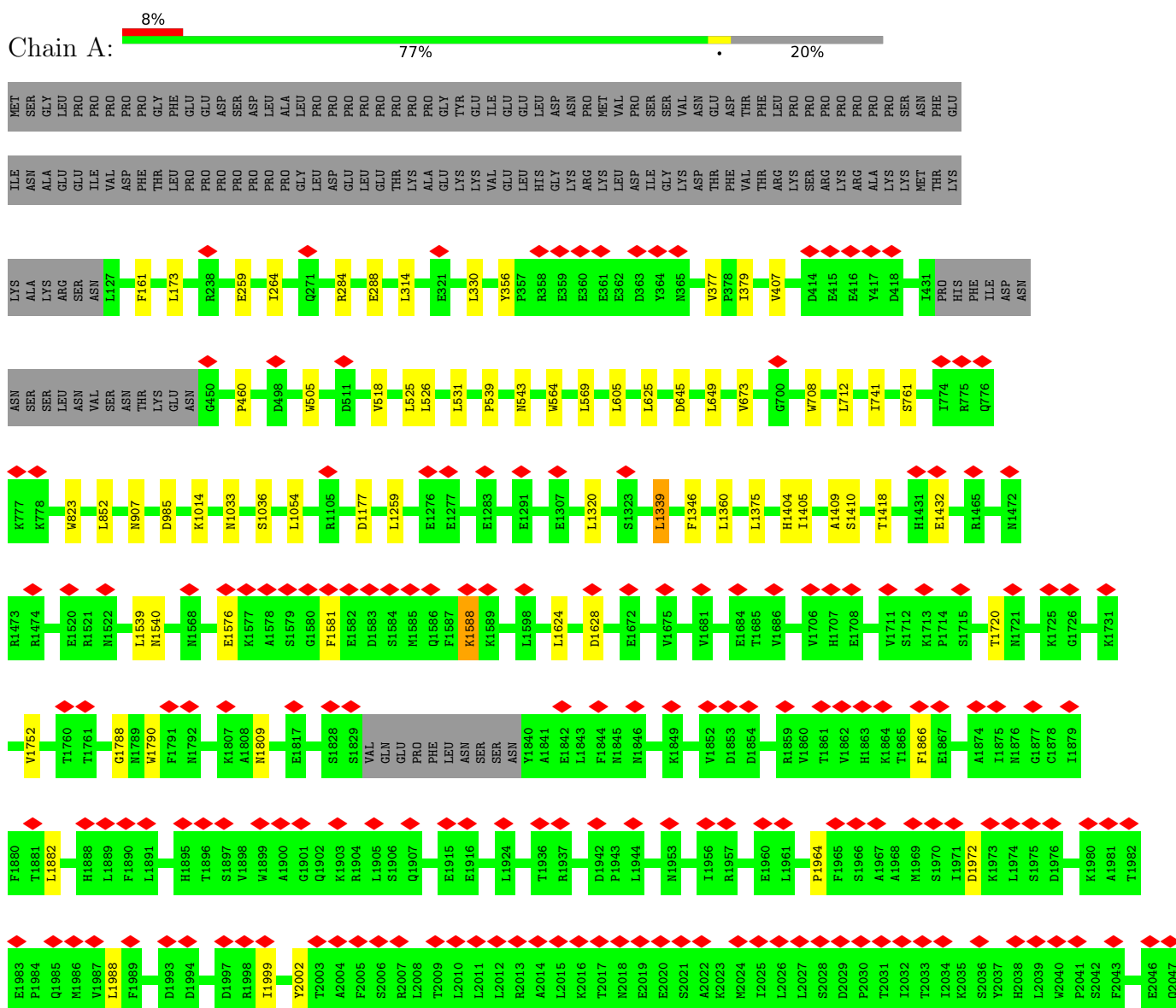
- Molecule 38 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
			Total	Zn	
38	Q	2	2	2	0
38	R	1	1	1	0
38	T	3	3	3	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.

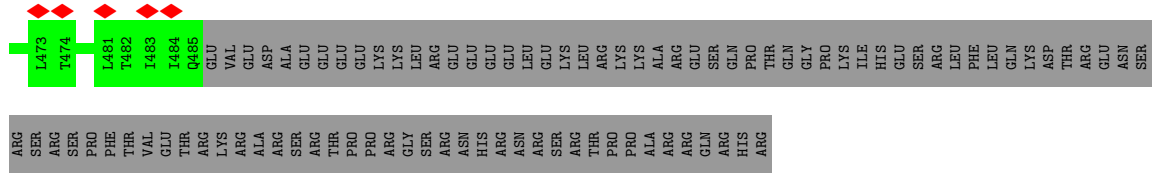
- Molecule 1: Pre-mRNA-splicing factor 8



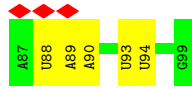




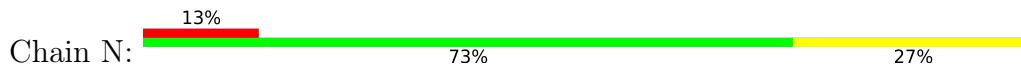




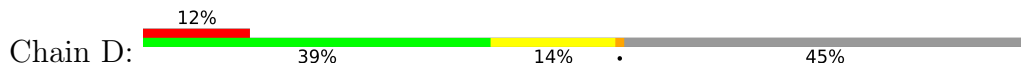
• Molecule 11: 5'-exon



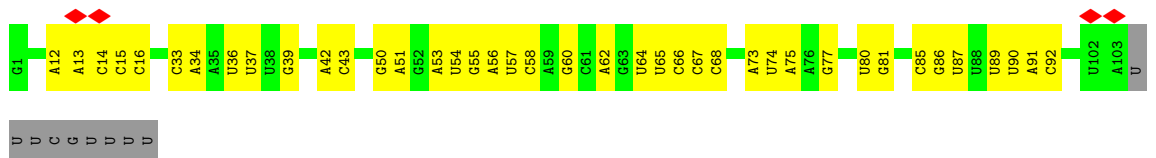
• Molecule 12: 5'-intron-lariat



• Molecule 13: U5 snRNA



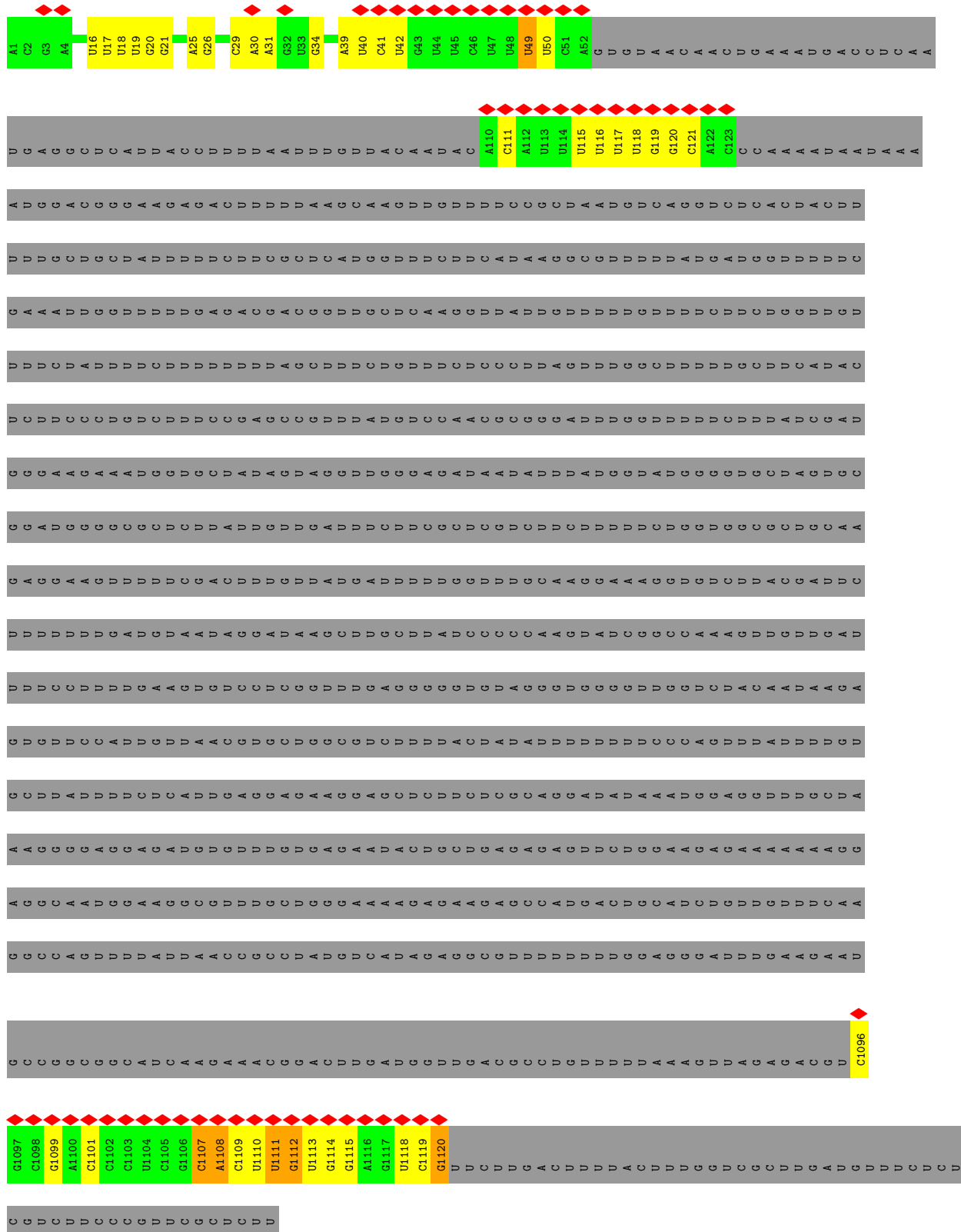
• Molecule 14: Saccharomyces cerevisiae S288c SNR6 snRNA



• Molecule 15: RNA (91-MER)







- Molecule 16: 3'-intron-lariat



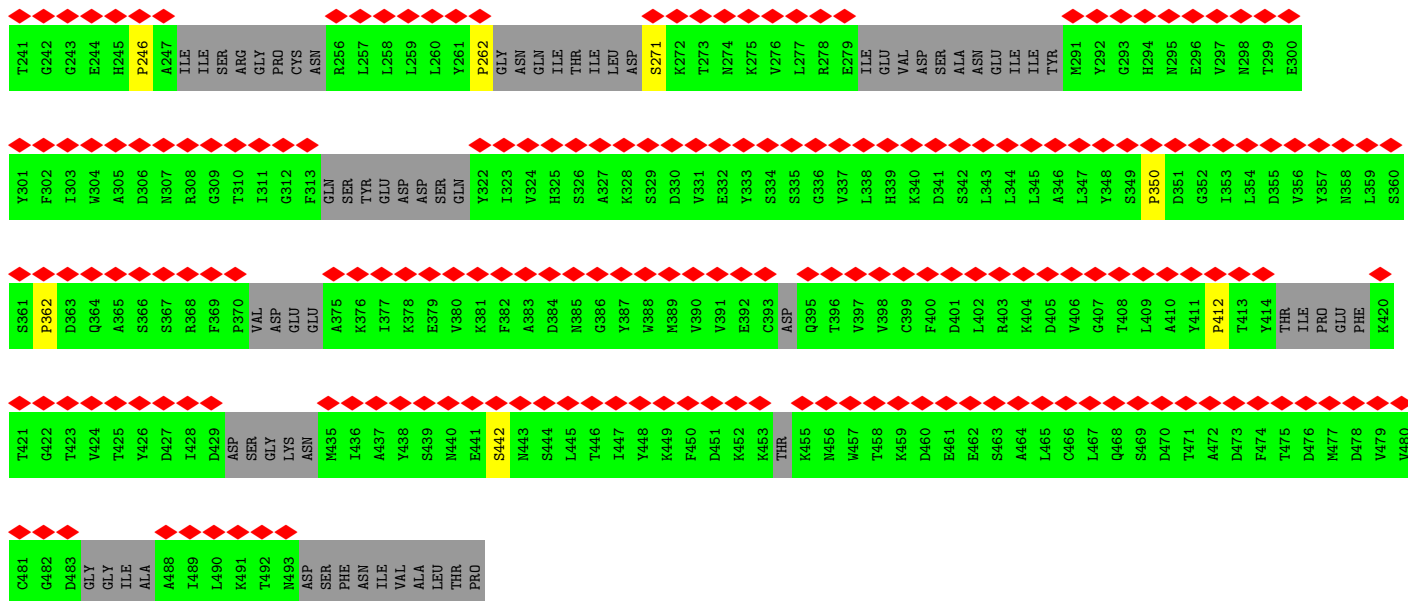




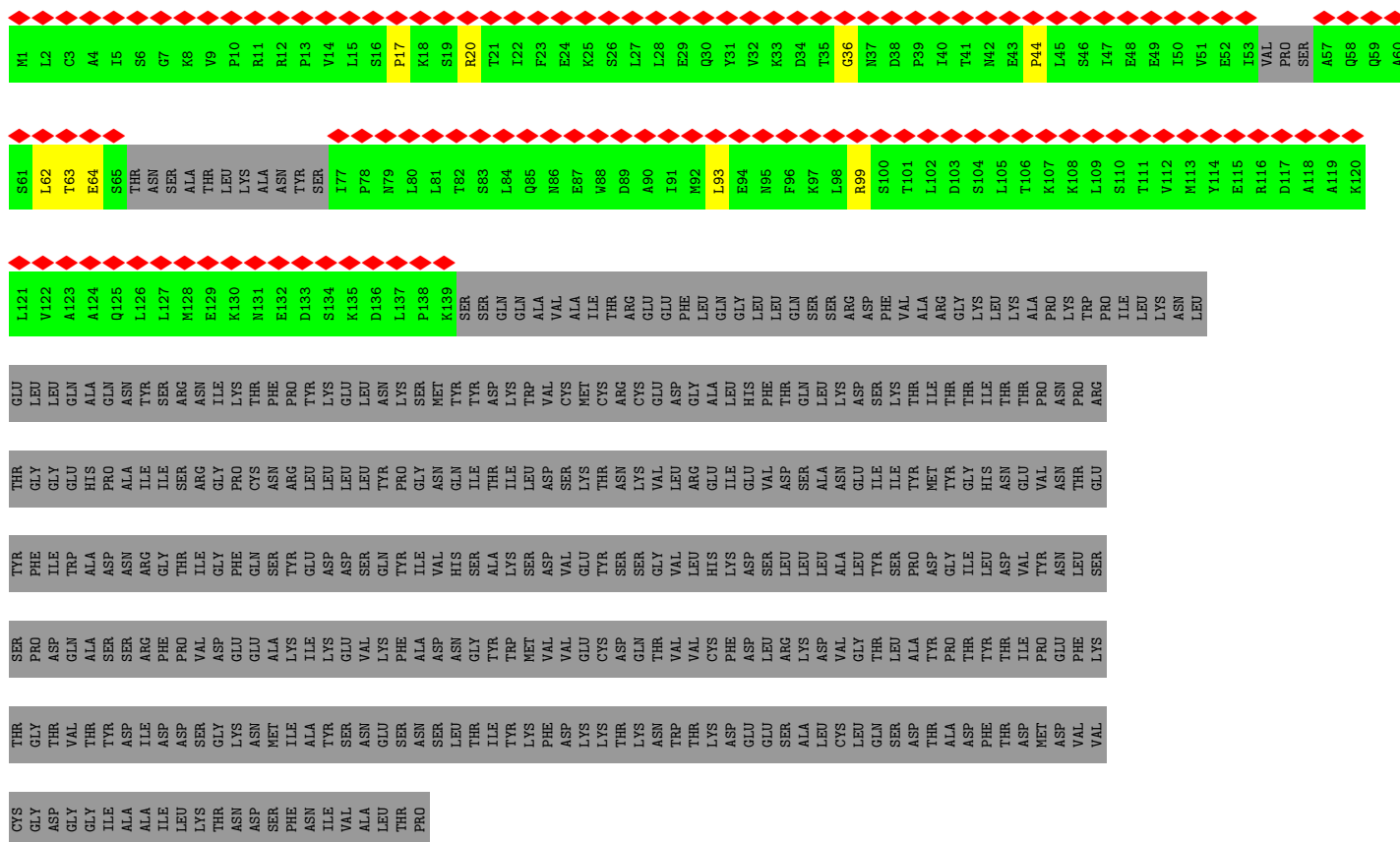




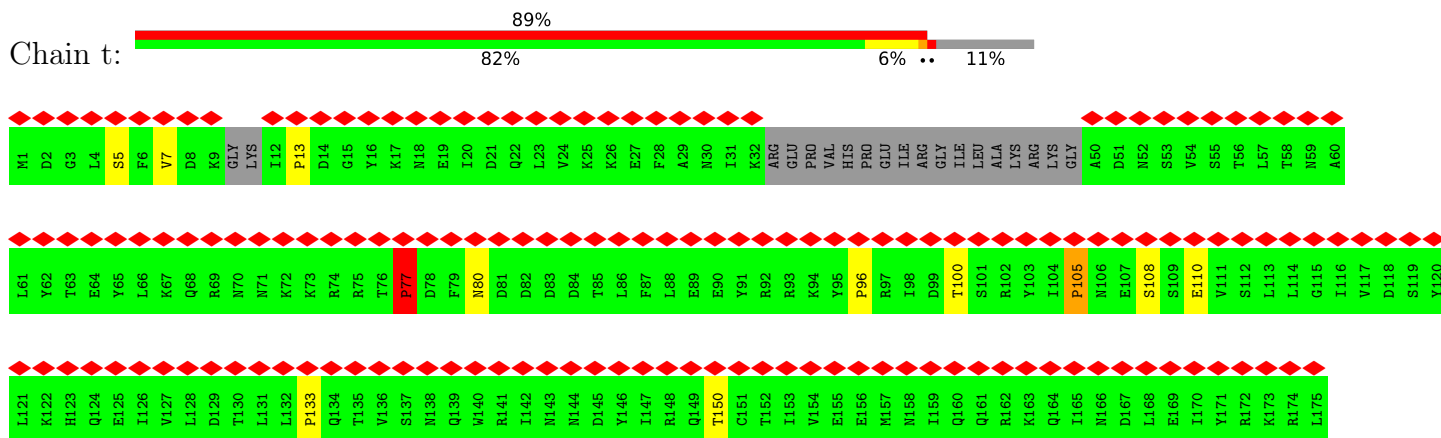




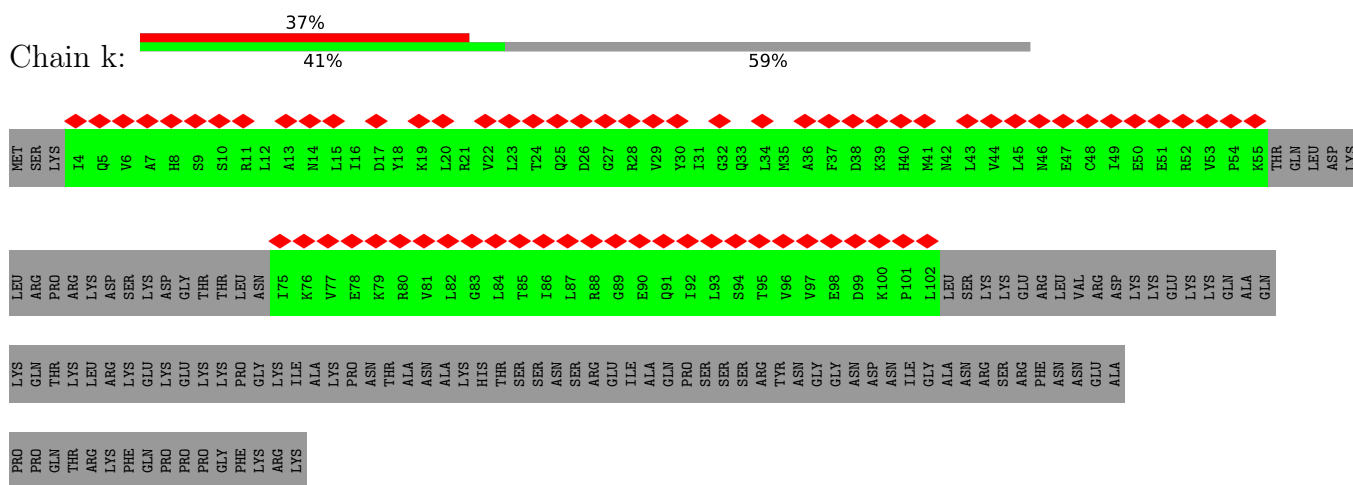
• Molecule 22: Pre-mRNA-processing factor 19



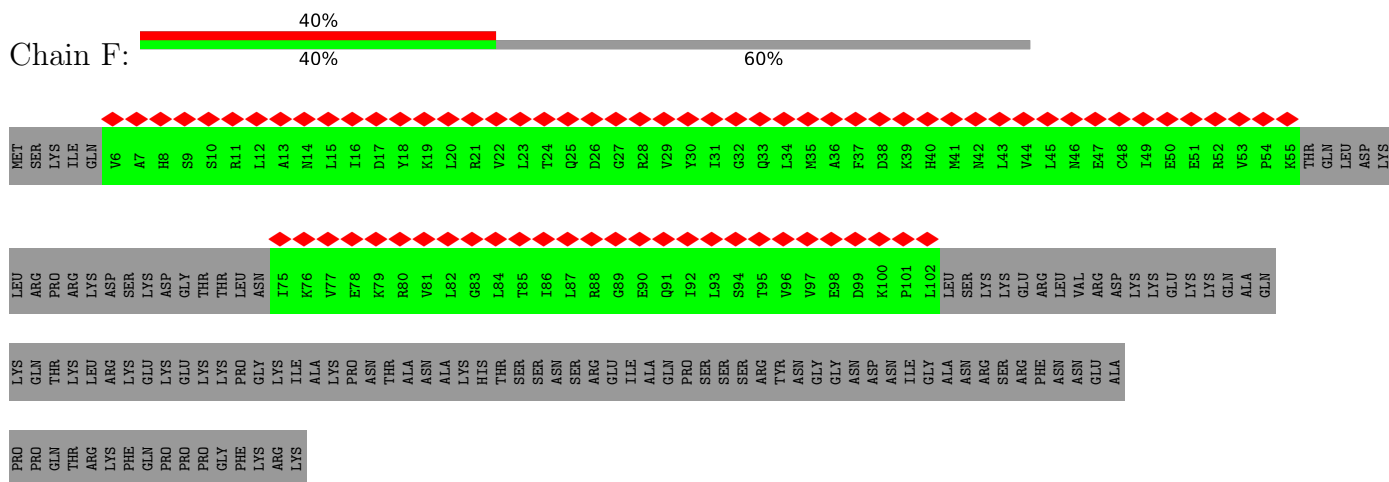
• Molecule 23: Pre-mRNA-splicing factor SNT309



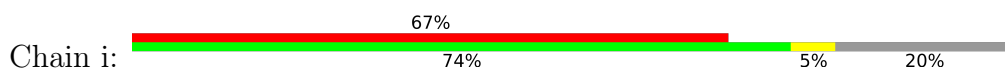
• Molecule 24: Small nuclear ribonucleoprotein-associated protein B



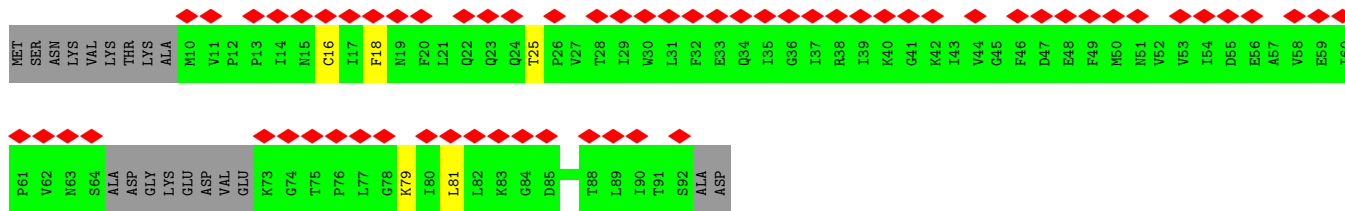
• Molecule 24: Small nuclear ribonucleoprotein-associated protein B



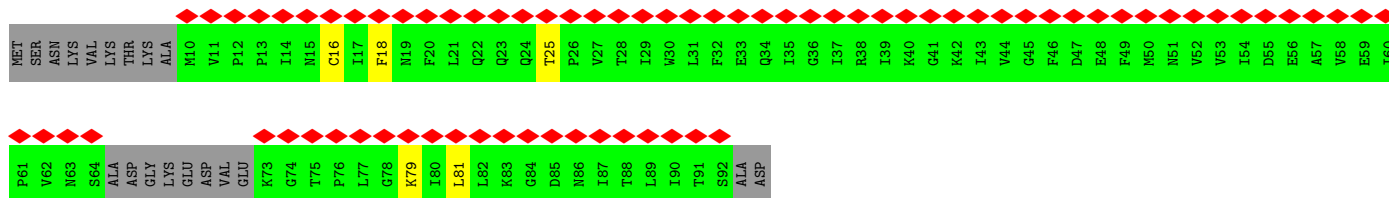
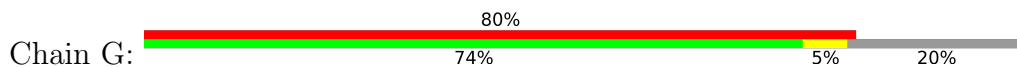
• Molecule 25: Small nuclear ribonucleoprotein E



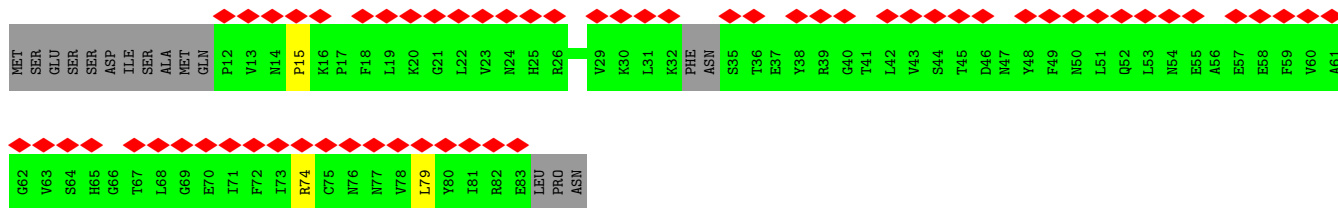
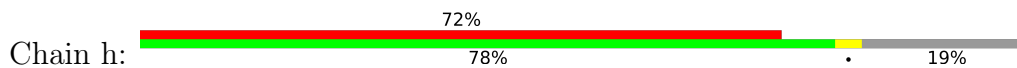




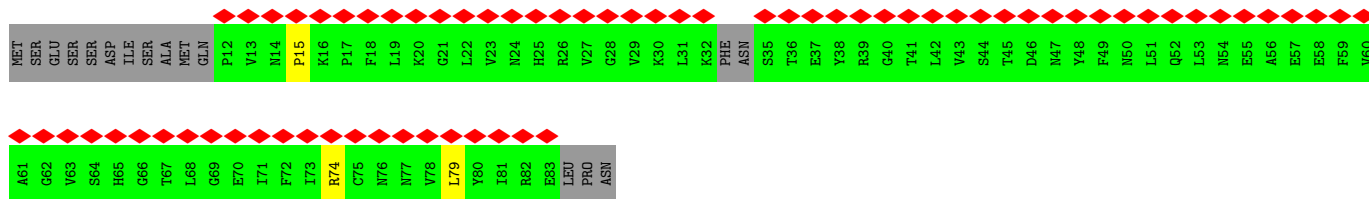
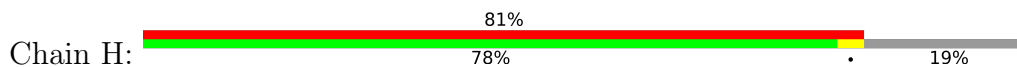
• Molecule 25: Small nuclear ribonucleoprotein E



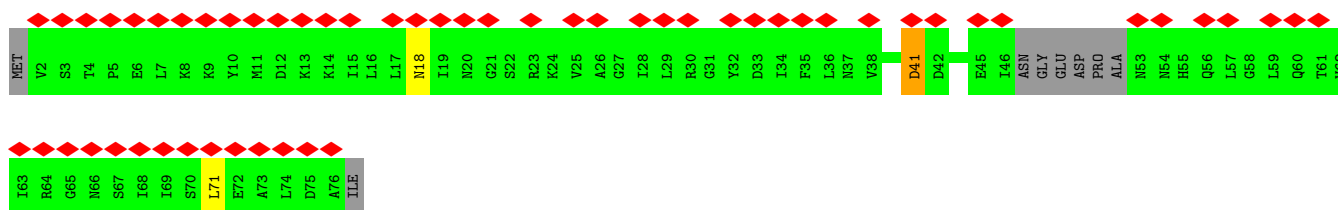
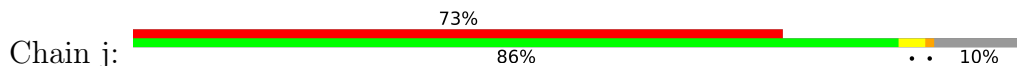
• Molecule 26: Small nuclear ribonucleoprotein F



• Molecule 26: Small nuclear ribonucleoprotein F

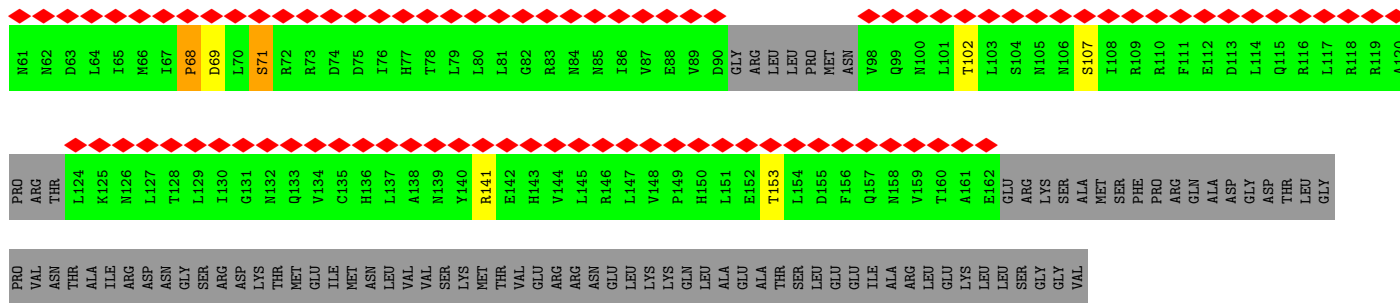


• Molecule 27: Small nuclear ribonucleoprotein G

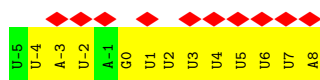




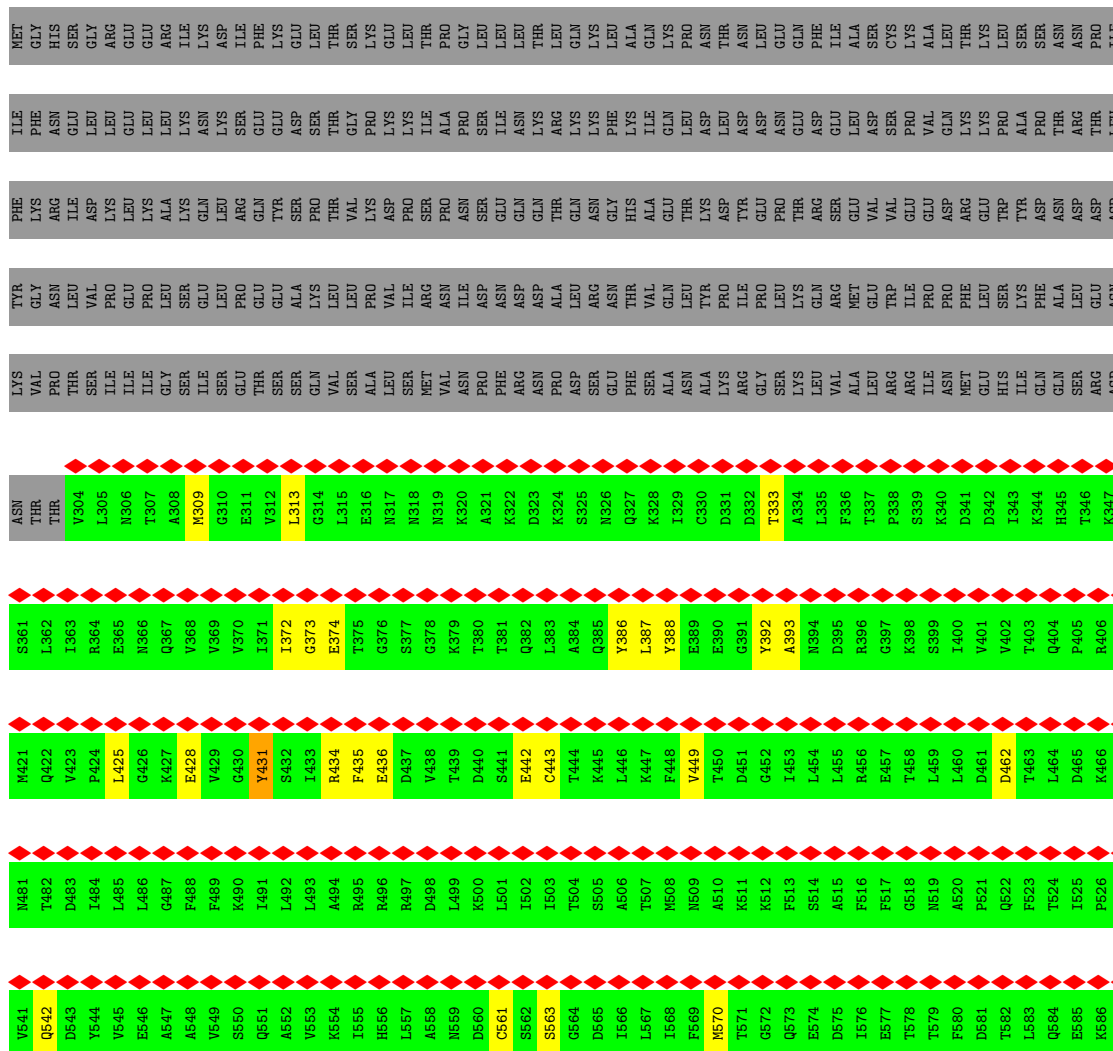




• Molecule 33: 3'-exon-intron



• Molecule 34: Pre-mRNA-splicing factor ATP-dependent RNA helicase PRP16





## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	27558	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	1.6	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.191	Depositor
Minimum map value	-0.094	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.007	Depositor
Recommended contour level	0.0297	Depositor
Map size ( $\text{\AA}$ )	522.4, 522.4, 522.4	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles ( $^\circ$ )	90.0, 90.0, 90.0	wwPDB
Pixel spacing ( $\text{\AA}$ )	1.3060001, 1.3060001, 1.3060001	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: ZN, GTP, MG

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	0.81	5/16346 (0.0%)	0.81	19/22154 (0.1%)
2	C	0.79	1/7168 (0.0%)	0.80	7/9707 (0.1%)
3	J	0.70	0/191	0.80	0/254
4	O	0.98	3/2704 (0.1%)	0.89	5/3676 (0.1%)
5	P	0.66	0/1604	0.78	1/2160 (0.0%)
6	Q	0.64	0/1496	0.76	1/2014 (0.0%)
7	R	0.72	0/2135	0.76	2/2871 (0.1%)
8	S	0.70	0/574	0.85	0/766
9	T	0.81	3/1315 (0.2%)	0.79	0/1759
10	Z	0.55	0/3712	0.75	5/5004 (0.1%)
11	B	0.68	0/307	0.90	0/475
12	N	0.68	0/346	0.86	0/535
13	D	0.73	0/2747	0.92	3/4267 (0.1%)
14	E	0.72	0/2452	0.95	3/3817 (0.1%)
15	L	0.75	13/2123 (0.6%)	1.12	18/3295 (0.5%)
16	M	0.29	0/543	0.72	0/842
17	c	0.38	0/2405	0.54	0/3218
18	d	0.42	0/2107	0.54	0/2852
19	I	0.35	0/826	0.53	0/1097
20	v	1.05	8/905 (0.9%)	0.76	6/1214 (0.5%)
21	n	1.47	17/1878 (0.9%)	0.89	15/2503 (0.6%)
22	o	0.40	0/835	0.53	0/1126
22	p	0.40	0/848	0.55	0/1143
22	q	0.44	0/2342	0.65	0/3139
22	r	0.39	0/828	0.54	1/1117 (0.1%)
23	t	0.42	0/924	0.56	2/1244 (0.2%)
24	F	0.37	0/615	0.61	0/829
24	k	0.37	0/636	0.61	0/856
25	G	0.42	0/585	0.62	0/795
25	i	0.42	0/585	0.62	0/795
26	H	0.44	0/564	0.66	1/761 (0.1%)
26	h	0.44	0/564	0.65	1/761 (0.1%)

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
27	K	0.37	0/532	0.60	0/715
27	j	0.37	0/532	0.60	0/715
28	U	0.40	0/634	0.70	0/859
28	l	0.40	0/634	0.70	0/859
29	V	0.41	0/649	0.61	0/880
29	m	0.41	0/649	0.61	0/880
30	W	0.43	0/535	0.66	2/717 (0.3%)
30	g	0.45	0/753	0.69	2/1013 (0.2%)
31	X	0.82	4/514 (0.8%)	1.32	2/686 (0.3%)
32	Y	1.03	9/839 (1.1%)	1.65	11/1127 (1.0%)
33	b	0.20	0/227	0.73	0/346
34	e	0.48	0/3357	1.09	4/4674 (0.1%)
35	f	0.29	0/1227	0.50	0/1665
All	All	0.71	63/74292 (0.1%)	0.81	111/102182 (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
1	A	0	24
2	C	0	10
4	O	0	10
5	P	0	5
6	Q	0	6
7	R	0	3
8	S	0	1
9	T	0	5
10	Z	0	2
17	c	0	2
18	d	0	1
21	n	0	4
27	K	0	1
27	j	0	1
28	U	0	2
28	l	0	2
30	W	0	2
30	g	0	2
34	e	0	32
All	All	0	115

All (63) bond length outliers are listed below:



Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
21	n	399	CYS	CB-SG	-24.14	1.41	1.82
21	n	444	CYS	CB-SG	-22.91	1.43	1.82
21	n	454	CYS	CB-SG	-19.93	1.48	1.82
21	n	218	CYS	CB-SG	-19.55	1.49	1.82
21	n	352	CYS	CB-SG	-18.81	1.50	1.82
21	n	198	CYS	CB-SG	-17.76	1.52	1.82
20	v	712	CYS	CB-SG	-17.12	1.53	1.82
15	L	1096	C	O3'-P	-10.06	1.49	1.61
20	v	723	SER	CB-OG	8.59	1.53	1.42
20	v	718	SER	CB-OG	8.57	1.53	1.42
20	v	714	SER	CB-OG	7.95	1.52	1.42
21	n	440	SER	CB-OG	7.84	1.52	1.42
20	v	681	SER	CB-OG	7.83	1.52	1.42
9	T	148	CYS	CB-SG	-7.54	1.69	1.82
15	L	1096	C	C1'-N1	7.47	1.59	1.48
32	Y	46	SER	CB-OG	7.46	1.51	1.42
21	n	381	SER	CB-OG	7.34	1.51	1.42
15	L	1120	G	C1'-N9	-7.34	1.36	1.46
15	L	1118	U	C1'-N1	7.33	1.59	1.48
32	Y	45	SER	CB-OG	7.32	1.51	1.42
31	X	33	SER	CB-OG	7.10	1.51	1.42
32	Y	69	ASP	CA-CB	-6.99	1.38	1.53
32	Y	6	SER	CB-OG	6.93	1.51	1.42
20	v	633	SER	CB-OG	6.83	1.51	1.42
15	L	1111	U	C1'-N1	6.77	1.58	1.48
15	L	1101	C	C1'-N1	6.76	1.58	1.48
15	L	1119	C	C1'-N1	6.76	1.58	1.48
1	A	708	TRP	CB-CG	-6.61	1.38	1.50
21	n	415	SER	CB-OG	6.60	1.50	1.42
15	L	1115	G	C1'-N9	-6.59	1.37	1.46
21	n	268	SER	CB-OG	6.59	1.50	1.42
15	L	1109	C	C1'-N1	6.06	1.57	1.48
21	n	220	SER	CB-OG	6.02	1.50	1.42
32	Y	42	SER	CB-OG	5.89	1.50	1.42
21	n	388	SER	CB-OG	5.84	1.49	1.42
21	n	403	SER	CB-OG	5.83	1.49	1.42
1	A	505	TRP	CB-CG	-5.82	1.39	1.50
32	Y	102	THR	CB-OG1	5.80	1.54	1.43
20	v	640	SER	CB-OG	5.72	1.49	1.42
21	n	351	PHE	CB-CG	-5.68	1.41	1.51
4	O	251	TRP	CB-CG	-5.68	1.40	1.50
32	Y	15	TYR	CB-CG	-5.68	1.43	1.51
15	L	121	C	C1'-N1	5.66	1.57	1.48

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	O	167	TRP	CB-CG	-5.63	1.40	1.50
15	L	1112	G	C1'-N9	-5.61	1.39	1.46
32	Y	51	THR	CB-OG1	5.58	1.54	1.43
21	n	432	VAL	CB-CG1	-5.43	1.41	1.52
21	n	275	TYR	CB-CG	-5.42	1.43	1.51
9	T	105	CYS	CB-SG	-5.36	1.73	1.81
1	A	564	TRP	CB-CG	-5.29	1.40	1.50
20	v	685	GLU	CB-CG	-5.28	1.42	1.52
1	A	823	TRP	CB-CG	-5.24	1.40	1.50
31	X	75	THR	CB-OG1	5.20	1.53	1.43
2	C	933	TRP	CB-CG	-5.20	1.40	1.50
4	O	155	PHE	CB-CG	-5.20	1.42	1.51
31	X	110	THR	CB-OG1	5.20	1.53	1.43
1	A	673	VAL	CB-CG1	-5.15	1.42	1.52
32	Y	153	THR	CB-OG1	5.12	1.53	1.43
15	L	49	U	C1'-N1	5.12	1.56	1.48
9	T	122	CYS	CB-SG	-5.08	1.73	1.81
31	X	65	PHE	CB-CG	-5.08	1.42	1.51
21	n	291	HIS	CA-CB	-5.05	1.42	1.53
15	L	50	U	C1'-N1	5.04	1.56	1.48

All (111) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
15	L	1110	U	C5-C4-O4	11.94	133.07	125.90
15	L	1107	C	N1-C2-O2	-10.12	112.83	118.90
32	Y	44	PRO	N-CA-CB	8.85	113.92	103.30
15	L	1109	C	O4'-C1'-N1	8.79	115.23	108.20
2	C	656	LEU	CA-CB-CG	-8.46	95.84	115.30
1	A	525	LEU	CA-CB-CG	-8.39	96.01	115.30
15	L	1112	G	P-O3'-C3'	8.35	129.72	119.70
15	L	1107	C	C5'-C4'-O4'	-8.29	99.15	109.10
15	L	1110	U	N3-C4-O4	-8.14	113.70	119.40
34	e	373	GLY	O-C-N	7.94	135.41	122.70
1	A	1339	LEU	CB-CG-CD2	-7.89	97.58	111.00
1	A	1882	LEU	C-N-CA	-7.83	102.14	121.70
15	L	1107	C	P-O3'-C3'	7.58	128.79	119.70
15	L	1110	U	N1-C2-O2	7.51	128.05	122.80
15	L	1107	C	N3-C2-O2	7.49	127.14	121.90
4	O	250	LEU	CA-CB-CG	-7.40	98.29	115.30
21	n	428	PRO	N-CA-CB	7.37	112.14	103.30
32	Y	5	PRO	N-CA-CB	7.22	111.97	103.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
32	Y	42	SER	N-CA-CB	-7.22	99.66	110.50
15	L	1111	U	P-O5'-C5'	-7.10	109.53	120.90
15	L	1110	U	N3-C2-O2	-6.97	117.32	122.20
15	L	1108	A	O4'-C1'-N9	-6.95	102.64	108.20
7	R	231	ASP	CB-CG-OD1	6.94	124.55	118.30
1	A	569	LEU	CA-CB-CG	-6.90	99.42	115.30
34	e	373	GLY	C-N-CA	6.78	138.64	121.70
32	Y	12	PRO	N-CA-CB	6.73	111.38	103.30
20	v	617	PRO	CA-CB-CG	6.62	117.37	104.80
20	v	613	PRO	N-CA-CB	6.51	111.12	103.30
5	P	135	VAL	C-N-CA	-6.50	105.46	121.70
20	v	722	PRO	N-CA-CB	6.45	111.05	103.30
1	A	526	LEU	CA-CB-CG	-6.45	100.47	115.30
4	O	119	LEU	CA-CB-CG	-6.43	100.52	115.30
1	A	531	LEU	CA-CB-CG	-6.42	100.54	115.30
1	A	1624	LEU	CB-CG-CD2	-6.39	100.13	111.00
32	Y	57	LEU	N-CA-CB	6.35	123.10	110.40
32	Y	4	THR	N-CA-CB	-6.32	98.28	110.30
1	A	1054	LEU	CA-CB-CG	-6.29	100.83	115.30
1	A	1360	LEU	CA-CB-CG	-6.24	100.95	115.30
21	n	159	PRO	N-CA-CB	6.15	110.67	103.30
4	O	211	LEU	CA-CB-CG	-6.12	101.22	115.30
10	Z	37	LEU	CA-CB-CG	6.12	129.38	115.30
21	n	373	PRO	N-CA-CB	6.12	110.64	103.30
21	n	257	PRO	N-CA-CB	6.11	110.63	103.30
21	n	208	PRO	N-CA-CB	6.06	110.57	103.30
20	v	641	PRO	CA-CB-CG	6.01	116.21	104.80
21	n	424	PRO	N-CA-CB	6.00	110.50	103.30
13	D	79	C	C2-N1-C1'	5.98	125.38	118.80
20	v	616	PRO	N-CA-CB	5.95	110.44	103.30
32	Y	141	ARG	CD-NE-CZ	5.92	131.89	123.60
32	Y	7	ILE	CA-CB-CG1	5.92	122.24	111.00
15	L	1107	C	C5-C4-N4	-5.87	116.09	120.20
15	L	1111	U	C5'-C4'-C3'	-5.83	106.68	116.00
15	L	1110	U	O3'-P-O5'	-5.79	93.00	104.00
1	A	605	LEU	CA-CB-CG	-5.78	102.00	115.30
21	n	162	PRO	N-CA-CB	5.78	110.23	103.30
23	t	105	PRO	CA-CB-CG	5.78	115.78	104.80
21	n	373	PRO	CA-CB-CG	5.77	115.76	104.80
34	e	431	TYR	C-N-CA	5.76	136.10	121.70
10	Z	321	LEU	CA-CB-CG	-5.75	102.08	115.30
10	Z	148	LEU	CA-CB-CG	-5.74	102.09	115.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
21	n	327	PRO	N-CA-CB	5.71	110.15	103.30
21	n	436	PRO	N-CA-CB	5.69	110.13	103.30
1	A	1259	LEU	CB-CG-CD2	-5.68	101.34	111.00
32	Y	68	PRO	N-CA-CB	5.68	110.12	103.30
21	n	436	PRO	CA-CB-CG	5.65	115.54	104.80
10	Z	470	LEU	CA-CB-CG	5.65	128.29	115.30
2	C	109	LEU	CA-CB-CG	5.64	128.27	115.30
2	C	962	LEU	CB-CG-CD2	-5.63	101.43	111.00
1	A	1320	LEU	CA-CB-CG	-5.59	102.45	115.30
30	W	81	GLY	CA-C-N	-5.56	104.97	117.20
30	g	81	GLY	CA-C-N	-5.54	105.02	117.20
21	n	260	PRO	N-CA-CB	5.53	109.94	103.30
21	n	306	SER	N-CA-CB	-5.53	102.21	110.50
34	e	618	ASP	CB-CA-C	5.52	121.44	110.40
1	A	852	LEU	CA-CB-CG	-5.50	102.64	115.30
2	C	873	LEU	CA-CB-CG	-5.48	102.69	115.30
2	C	925	LEU	CA-CB-CG	-5.48	102.70	115.30
14	E	77	G	C6-C5-N7	-5.47	127.12	130.40
1	A	625	LEU	CB-CG-CD1	-5.45	101.74	111.00
1	A	712	LEU	CA-CB-CG	-5.41	102.86	115.30
7	R	204	LEU	C-N-CA	5.41	135.21	121.70
1	A	173	LEU	CB-CG-CD1	-5.39	101.83	111.00
1	A	330	LEU	CA-CB-CG	-5.34	103.02	115.30
6	Q	226	LEU	CA-CB-CG	5.33	127.57	115.30
23	t	77	PRO	CA-CB-CG	5.31	114.89	104.80
1	A	314	LEU	CB-CG-CD2	-5.30	101.99	111.00
15	L	1113	U	O4'-C1'-C2'	-5.29	100.51	105.80
4	O	364	LEU	CB-CG-CD1	-5.28	102.02	111.00
14	E	58	C	C2-N1-C1'	5.28	124.61	118.80
21	n	340	PRO	N-CA-CB	5.27	109.62	103.30
26	H	74	ARG	NE-CZ-NH1	5.27	122.94	120.30
32	Y	71	SER	N-CA-CB	-5.22	102.67	110.50
22	r	62	LEU	CA-CB-CG	-5.22	103.30	115.30
15	L	1119	C	OP1-P-OP2	-5.20	111.80	119.60
26	h	74	ARG	NE-CZ-NH1	5.16	122.88	120.30
21	n	295	SER	N-CA-CB	-5.14	102.80	110.50
1	A	649	LEU	CB-CG-CD1	-5.13	102.28	111.00
4	O	316	LEU	CA-CB-CG	-5.13	103.50	115.30
10	Z	313	LEU	CA-CB-CG	-5.10	103.58	115.30
13	D	90	C	C5-C6-N1	5.10	123.55	121.00
30	W	82	LYS	N-CA-C	5.09	124.76	111.00
2	C	400	LEU	CA-CB-CG	-5.09	103.60	115.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
20	v	617	PRO	N-CA-CB	5.08	109.40	103.30
14	E	55	G	N3-C4-N9	5.08	129.05	126.00
30	g	82	LYS	N-CA-C	5.08	124.71	111.00
31	X	46	VAL	CA-CB-CG2	5.07	118.50	110.90
31	X	33	SER	N-CA-CB	5.06	118.09	110.50
32	Y	107	SER	N-CA-CB	-5.06	102.91	110.50
15	L	1096	C	OP2-P-O3'	5.02	116.24	105.20
13	D	90	C	C2-N1-C1'	5.01	124.32	118.80
2	C	821	LEU	CA-CB-CG	-5.01	103.78	115.30

There are no chirality outliers.

All (115) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1014	LYS	Peptide
1	A	1036	SER	Peptide
1	A	1346	PHE	Peptide
1	A	1375	LEU	Peptide
1	A	1409	ALA	Peptide
1	A	1410	SER	Peptide
1	A	1418	THR	Peptide
1	A	1432	GLU	Peptide
1	A	1539	LEU	Peptide
1	A	1588	LYS	Peptide
1	A	1720	THR	Peptide
1	A	1788	GLY	Peptide
1	A	1790	TRP	Peptide
1	A	1809	ASN	Peptide
1	A	1972	ASP	Peptide
1	A	1999	ILE	Peptide
1	A	259	GLU	Peptide
1	A	288	GLU	Peptide
1	A	356	TYR	Peptide
1	A	460	PRO	Peptide
1	A	539	PRO	Peptide
1	A	761	SER	Peptide
1	A	907	ASN	Peptide
1	A	985	ASP	Peptide
2	C	170	LEU	Peptide
2	C	171	GLY	Peptide
2	C	231	ALA	Peptide
2	C	350	GLY	Peptide

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>Group</b>
2	C	365	GLU	Peptide
2	C	369	LYS	Peptide
2	C	467	THR	Peptide
2	C	554	HIS	Peptide
2	C	70	TYR	Peptide
2	C	82	ASN	Peptide
27	K	41	ASP	Peptide
4	O	123	PRO	Peptide
4	O	155	PHE	Peptide
4	O	278	ASP	Peptide
4	O	305	THR	Peptide
4	O	376	TYR	Peptide
4	O	431	THR	Peptide
4	O	434	LYS	Peptide
4	O	435	GLU	Peptide
4	O	437	GLU	Peptide
4	O	441	ALA	Peptide
5	P	101	PRO	Peptide
5	P	103	ASN	Peptide
5	P	35	ALA	Peptide
5	P	84	ASN	Peptide
5	P	85	SER	Peptide
6	Q	103	GLU	Peptide
6	Q	291	ILE	Peptide
6	Q	45	HIS	Peptide
6	Q	6	ASN	Peptide
6	Q	94	VAL	Peptide
6	Q	98	ASN	Peptide
7	R	125	GLY	Peptide
7	R	150	HIS	Peptide
7	R	203	THR	Peptide
8	S	172	LYS	Peptide
9	T	104	CYS	Peptide
9	T	116	ASN	Peptide
9	T	118	SER	Peptide
9	T	155	SER	Peptide
9	T	5	LYS	Peptide
28	U	81	ALA	Mainchain,Peptide
30	W	81	GLY	Mainchain,Peptide
10	Z	23	SER	Peptide
10	Z	285	SER	Peptide
17	c	65	PHE	Peptide

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>Group</b>
17	c	81	PRO	Peptide
18	d	212	HIS	Peptide
34	e	309	MET	Peptide
34	e	313	LEU	Peptide
34	e	372	ILE	Peptide
34	e	386	TYR	Peptide
34	e	387	LEU	Peptide
34	e	431	TYR	Peptide
34	e	436	GLU	Peptide
34	e	443	CYS	Peptide
34	e	449	VAL	Peptide
34	e	532	VAL	Peptide
34	e	542	GLN	Peptide
34	e	563	SER	Peptide
34	e	570	MET	Peptide
34	e	595	PHE	Peptide
34	e	604	ASN	Peptide
34	e	610	PRO	Peptide
34	e	627	LEU	Peptide
34	e	631	LYS	Mainchain,Peptide
34	e	654	ILE	Peptide
34	e	709	GLU	Peptide
34	e	733	SER	Peptide
34	e	737	THR	Peptide
34	e	738	ASP	Peptide
34	e	796	ALA	Peptide
34	e	810	SER	Peptide
34	e	857	PHE	Peptide
34	e	898	LYS	Peptide
34	e	924	TYR	Peptide
34	e	947	LEU	Peptide
34	e	953	TYR	Peptide
34	e	986	LYS	Peptide
30	g	81	GLY	Mainchain,Peptide
27	j	41	ASP	Peptide
28	l	81	ALA	Mainchain,Peptide
21	n	290	ASP	Peptide
21	n	305	GLY	Peptide
21	n	67	GLY	Mainchain,Peptide

## 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	1925/2413 (80%)	1569 (82%)	339 (18%)	17 (1%)	17	55
2	C	872/1008 (86%)	735 (84%)	129 (15%)	8 (1%)	17	55
3	J	25/135 (18%)	21 (84%)	4 (16%)	0	100	100
4	O	335/451 (74%)	281 (84%)	49 (15%)	5 (2%)	10	45
5	P	193/379 (51%)	160 (83%)	27 (14%)	6 (3%)	4	31
6	Q	177/364 (49%)	145 (82%)	30 (17%)	2 (1%)	14	51
7	R	259/339 (76%)	218 (84%)	40 (15%)	1 (0%)	34	71
8	S	63/175 (36%)	49 (78%)	12 (19%)	2 (3%)	4	31
9	T	155/157 (99%)	123 (79%)	28 (18%)	4 (3%)	5	34
10	Z	443/577 (77%)	369 (83%)	68 (15%)	6 (1%)	11	46
17	c	312/579 (54%)	273 (88%)	35 (11%)	4 (1%)	12	48
18	d	238/652 (36%)	201 (84%)	35 (15%)	2 (1%)	19	58
19	I	98/215 (46%)	85 (87%)	13 (13%)	0	100	100
20	v	121/858 (14%)	110 (91%)	7 (6%)	4 (3%)	4	30
21	n	272/455 (60%)	234 (86%)	28 (10%)	10 (4%)	3	28
22	o	120/503 (24%)	115 (96%)	4 (3%)	1 (1%)	19	58
22	p	122/503 (24%)	116 (95%)	6 (5%)	0	100	100
22	q	355/503 (71%)	327 (92%)	16 (4%)	12 (3%)	3	30
22	r	119/503 (24%)	111 (93%)	5 (4%)	3 (2%)	5	35
23	t	150/175 (86%)	134 (89%)	13 (9%)	3 (2%)	7	40
24	F	74/196 (38%)	67 (90%)	7 (10%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
24	k	76/196 (39%)	69 (91%)	7 (9%)	0	100	100
25	G	71/94 (76%)	65 (92%)	6 (8%)	0	100	100
25	i	71/94 (76%)	65 (92%)	6 (8%)	0	100	100
26	H	66/86 (77%)	61 (92%)	4 (6%)	1 (2%)	10	45
26	h	66/86 (77%)	61 (92%)	4 (6%)	1 (2%)	10	45
27	K	65/77 (84%)	64 (98%)	1 (2%)	0	100	100
27	j	65/77 (84%)	64 (98%)	1 (2%)	0	100	100
28	U	80/101 (79%)	70 (88%)	9 (11%)	1 (1%)	12	48
28	l	80/101 (79%)	70 (88%)	9 (11%)	1 (1%)	12	48
29	V	78/146 (53%)	74 (95%)	4 (5%)	0	100	100
29	m	78/146 (53%)	74 (95%)	4 (5%)	0	100	100
30	W	63/110 (57%)	58 (92%)	4 (6%)	1 (2%)	9	44
30	g	92/110 (84%)	85 (92%)	6 (6%)	1 (1%)	14	51
31	X	77/111 (69%)	75 (97%)	2 (3%)	0	100	100
32	Y	125/238 (52%)	111 (89%)	12 (10%)	2 (2%)	9	44
34	e	673/1071 (63%)	563 (84%)	75 (11%)	35 (5%)	2	21
35	f	144/251 (57%)	140 (97%)	4 (3%)	0	100	100
All	All	8398/14235 (59%)	7212 (86%)	1053 (12%)	133 (2%)	13	44

All (133) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	C	364	PHE
6	Q	99	VAL
10	Z	213	PHE
20	v	616	PRO
21	n	245	HIS
21	n	247	ASN
21	n	428	PRO
22	q	53	ILE
22	q	77	ILE
22	q	172	PRO
22	q	174	TRP
22	q	239	PRO
22	q	246	PRO
22	q	362	PRO

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
22	q	442	SER
22	r	64	GLU
23	t	77	PRO
32	Y	68	PRO
34	e	374	GLU
34	e	392	TYR
34	e	393	ALA
34	e	434	ARG
34	e	532	VAL
34	e	654	ILE
34	e	714	GLN
34	e	812	LEU
34	e	932	SER
34	e	933	VAL
34	e	948	PRO
34	e	988	ILE
1	A	1405	ILE
1	A	1540	ASN
2	C	363	PRO
4	O	286	THR
5	P	112	ILE
8	S	8	GLN
8	S	9	LEU
20	v	601	VAL
20	v	618	GLU
21	n	61	LYS
21	n	291	HIS
21	n	406	ARG
22	q	196	PRO
23	t	110	GLU
34	e	388	TYR
34	e	428	GLU
34	e	442	GLU
34	e	561	CYS
34	e	611	ILE
34	e	629	GLY
34	e	739	GLU
34	e	919	THR
1	A	1404	HIS
1	A	1581	PHE
1	A	1964	PRO
5	P	102	ALA

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
10	Z	303	LEU
17	c	230	THR
17	c	231	SER
20	v	634	HIS
21	n	244	LEU
22	o	17	PRO
22	r	20	ARG
23	t	80	ASN
34	e	435	PHE
34	e	462	ASP
34	e	655	ASP
34	e	816	GLN
1	A	645	ASP
1	A	1628	ASP
2	C	655	LEU
2	C	829	VAL
4	O	278	ASP
4	O	435	GLU
10	Z	53	ARG
21	n	267	LEU
28	l	82	PRO
30	g	82	LYS
28	U	82	PRO
30	W	82	LYS
34	e	333	THR
34	e	425	LEU
34	e	610	PRO
34	e	737	THR
34	e	944	LEU
34	e	946	ASP
34	e	985	ILE
1	A	264	ILE
1	A	543	ASN
1	A	1033	ASN
2	C	801	TRP
4	O	279	PRO
5	P	86	ASN
6	Q	93	LEU
7	R	92	HIS
9	T	98	THR
9	T	104	CYS
9	T	119	THR

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Mol	Chain	Res	Type
21	n	416	ARG
22	q	60	ALA
34	e	922	ARG
1	A	1177	ASP
1	A	2002	TYR
2	C	167	ASN
2	C	278	LYS
9	T	115	ASN
10	Z	154	VAL
10	Z	410	GLU
10	Z	415	GLN
18	d	151	ILE
34	e	604	ASN
34	e	937	PRO
4	O	263	VAL
5	P	34	ILE
17	c	16	VAL
17	c	218	VAL
22	q	36	GLY
26	h	15	PRO
26	H	15	PRO
32	Y	52	LYS
1	A	407	VAL
22	q	175	PRO
1	A	741	ILE
21	n	387	ILE
34	e	943	GLY
1	A	377	VAL
1	A	379	ILE
1	A	1752	VAL
5	P	166	PRO
2	C	704	PRO
5	P	219	ILE
18	d	188	ILE
22	r	36	GLY

### 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	1753/2182 (80%)	1745 (100%)	8 (0%)	88	93
2	C	794/910 (87%)	791 (100%)	3 (0%)	91	94
3	J	21/121 (17%)	21 (100%)	0	100	100
4	O	295/397 (74%)	294 (100%)	1 (0%)	92	95
5	P	173/328 (53%)	173 (100%)	0	100	100
6	Q	171/332 (52%)	170 (99%)	1 (1%)	86	92
7	R	224/296 (76%)	222 (99%)	2 (1%)	78	88
8	S	56/151 (37%)	54 (96%)	2 (4%)	35	61
9	T	141/141 (100%)	140 (99%)	1 (1%)	84	90
10	Z	417/538 (78%)	417 (100%)	0	100	100
17	c	212/308 (69%)	206 (97%)	6 (3%)	43	65
18	d	219/219 (100%)	219 (100%)	0	100	100
19	I	92/193 (48%)	92 (100%)	0	100	100
20	v	57/152 (38%)	47 (82%)	10 (18%)	2	12
21	n	122/413 (30%)	100 (82%)	22 (18%)	1	11
22	o	59/451 (13%)	52 (88%)	7 (12%)	5	24
22	p	62/451 (14%)	54 (87%)	8 (13%)	4	22
22	q	119/451 (26%)	102 (86%)	17 (14%)	3	19
22	r	60/451 (13%)	55 (92%)	5 (8%)	11	38
23	t	37/165 (22%)	27 (73%)	10 (27%)	0	3
24	F	67/176 (38%)	67 (100%)	0	100	100
24	k	70/176 (40%)	70 (100%)	0	100	100
25	G	65/83 (78%)	60 (92%)	5 (8%)	13	40
25	i	65/83 (78%)	60 (92%)	5 (8%)	13	40
26	H	61/77 (79%)	60 (98%)	1 (2%)	62	79
26	h	61/77 (79%)	60 (98%)	1 (2%)	62	79
27	K	58/66 (88%)	55 (95%)	3 (5%)	23	51
27	j	58/66 (88%)	55 (95%)	3 (5%)	23	51
28	U	69/89 (78%)	67 (97%)	2 (3%)	42	65
28	l	69/89 (78%)	67 (97%)	2 (3%)	42	65
29	V	77/129 (60%)	71 (92%)	6 (8%)	12	39

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
29	m	77/129 (60%)	71 (92%)	6 (8%)	12	39
30	W	59/103 (57%)	55 (93%)	4 (7%)	16	44
30	g	79/103 (77%)	74 (94%)	5 (6%)	18	46
31	X	26/100 (26%)	25 (96%)	1 (4%)	33	59
32	Y	47/219 (22%)	44 (94%)	3 (6%)	17	45
35	f	134/225 (60%)	131 (98%)	3 (2%)	52	71
All	All	6226/10640 (58%)	6073 (98%)	153 (2%)	50	68

All (153) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	161	PHE
1	A	284	ARG
1	A	518	VAL
1	A	1339	LEU
1	A	1576	GLU
1	A	1588	LYS
1	A	1866	PHE
1	A	1988	LEU
2	C	109	LEU
2	C	193	LEU
2	C	497	ASP
4	O	343	THR
6	Q	99	VAL
7	R	146	LEU
7	R	169	ASP
8	S	35	THR
8	S	36	THR
9	T	120	CYS
17	c	504	PRO
17	c	505	PRO
17	c	517	VAL
17	c	523	LEU
17	c	532	PRO
17	c	550	PRO
20	v	616	PRO
20	v	617	PRO
20	v	641	PRO
20	v	706	LEU
20	v	712	CYS

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
20	v	722	PRO
20	v	723	SER
20	v	725	THR
20	v	726	ARG
20	v	733	ILE
21	n	51	PHE
21	n	55	GLU
21	n	57	LYS
21	n	58	ARG
21	n	59	ARG
21	n	61	LYS
21	n	62	THR
21	n	66	ASP
21	n	159	PRO
21	n	162	PRO
21	n	208	PRO
21	n	257	PRO
21	n	258	THR
21	n	260	PRO
21	n	295	SER
21	n	306	SER
21	n	327	PRO
21	n	340	PRO
21	n	373	PRO
21	n	424	PRO
21	n	428	PRO
21	n	436	PRO
22	o	17	PRO
22	o	26	SER
22	o	44	PRO
22	o	63	THR
22	o	96	PHE
22	o	109	LEU
22	o	134	SER
22	p	17	PRO
22	p	44	PRO
22	p	63	THR
22	p	80	LEU
22	p	85	GLN
22	p	93	LEU
22	p	99	ARG
22	p	109	LEU

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
22	q	17	PRO
22	q	44	PRO
22	q	55	PRO
22	q	56	SER
22	q	61	SER
22	q	102	LEU
22	q	126	LEU
22	q	172	PRO
22	q	175	PRO
22	q	196	PRO
22	q	215	CYS
22	q	235	THR
22	q	239	PRO
22	q	262	PRO
22	q	271	SER
22	q	350	PRO
22	q	412	PRO
22	r	17	PRO
22	r	44	PRO
22	r	63	THR
22	r	93	LEU
22	r	99	ARG
23	t	5	SER
23	t	7	VAL
23	t	13	PRO
23	t	77	PRO
23	t	96	PRO
23	t	100	THR
23	t	105	PRO
23	t	108	SER
23	t	133	PRO
23	t	150	THR
25	i	16	CYS
25	i	18	PHE
25	i	25	THR
25	i	79	LYS
25	i	81	LEU
26	h	79	LEU
27	j	18	ASN
27	j	41	ASP
27	j	71	LEU
28	l	10	LEU

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Mol	Chain	Res	Type
28	l	76	ASP
29	m	20	LYS
29	m	26	TRP
29	m	30	GLN
29	m	77	ASP
29	m	99	ASP
29	m	104	ASP
30	g	24	PHE
30	g	49	ARG
30	g	77	THR
30	g	99	ASP
30	g	100	SER
25	G	16	CYS
25	G	18	PHE
25	G	25	THR
25	G	79	LYS
25	G	81	LEU
26	H	79	LEU
27	K	18	ASN
27	K	41	ASP
27	K	71	LEU
28	U	10	LEU
28	U	76	ASP
29	V	20	LYS
29	V	26	TRP
29	V	30	GLN
29	V	77	ASP
29	V	99	ASP
29	V	104	ASP
30	W	49	ARG
30	W	77	THR
30	W	99	ASP
30	W	100	SER
31	X	38	LYS
32	Y	4	THR
32	Y	44	PRO
32	Y	71	SER
35	f	81	ILE
35	f	134	GLU
35	f	184	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (109) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	138	HIS
1	A	146	HIS
1	A	178	ASN
1	A	265	ASN
1	A	343	ASN
1	A	365	ASN
1	A	405	ASN
1	A	429	ASN
1	A	541	ASN
1	A	558	GLN
1	A	570	GLN
1	A	584	HIS
1	A	658	ASN
1	A	659	HIS
1	A	705	GLN
1	A	733	GLN
1	A	760	ASN
1	A	784	GLN
1	A	785	HIS
1	A	796	ASN
1	A	839	HIS
1	A	861	GLN
1	A	864	GLN
1	A	868	GLN
1	A	976	GLN
1	A	1005	GLN
1	A	1011	ASN
1	A	1097	HIS
1	A	1156	HIS
1	A	1173	HIS
1	A	1368	GLN
1	A	1376	ASN
1	A	1431	HIS
1	A	1529	ASN
1	A	1532	HIS
1	A	1559	HIS
1	A	1592	HIS
1	A	1718	HIS
1	A	1782	ASN
1	A	1809	ASN
1	A	1856	ASN
1	A	1888	HIS
2	C	82	ASN

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
2	C	101	GLN
2	C	143	HIS
2	C	158	HIS
2	C	251	GLN
2	C	289	ASN
2	C	310	ASN
2	C	403	ASN
2	C	418	GLN
2	C	764	ASN
2	C	776	ASN
2	C	794	GLN
2	C	830	ASN
2	C	869	HIS
2	C	929	GLN
3	J	4	ASN
3	J	21	GLN
4	O	223	HIS
4	O	265	HIS
4	O	270	ASN
4	O	382	HIS
4	O	428	GLN
4	O	445	ASN
5	P	103	ASN
5	P	148	HIS
5	P	198	ASN
6	Q	72	GLN
6	Q	106	ASN
6	Q	209	ASN
7	R	91	HIS
7	R	202	GLN
7	R	227	ASN
7	R	252	HIS
8	S	5	HIS
8	S	34	HIS
8	S	173	HIS
9	T	57	HIS
9	T	112	ASN
9	T	143	HIS
10	Z	31	ASN
10	Z	107	ASN
10	Z	131	HIS
10	Z	223	HIS

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Mol	Chain	Res	Type
10	Z	225	HIS
10	Z	354	HIS
10	Z	457	HIS
17	c	72	GLN
17	c	83	GLN
17	c	214	ASN
18	d	67	GLN
19	I	184	GLN
19	I	202	GLN
25	i	34	GLN
25	i	86	ASN
27	j	66	ASN
28	l	41	ASN
29	m	30	GLN
25	G	34	GLN
25	G	86	ASN
26	H	52	GLN
27	K	66	ASN
28	U	41	ASN
29	V	30	GLN
30	W	71	ASN
35	f	87	GLN
35	f	169	HIS
35	f	171	GLN

### 5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
11	B	12/13 (92%)	5 (41%)	0
12	N	14/15 (93%)	4 (28%)	1 (7%)
13	D	114/214 (53%)	31 (27%)	3 (2%)
14	E	102/112 (91%)	33 (32%)	6 (5%)
15	L	88/1175 (7%)	30 (34%)	8 (9%)
16	M	22/23 (95%)	13 (59%)	3 (13%)
33	b	12/14 (85%)	12 (100%)	0
All	All	364/1566 (23%)	128 (35%)	21 (5%)

All (128) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
11	B	88	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
11	B	89	A
11	B	90	A
11	B	93	U
11	B	94	U
12	N	101	U
12	N	108	U
12	N	109	U
12	N	110	A
13	D	31	G
13	D	32	G
13	D	33	U
13	D	42	A
13	D	44	A
13	D	45	A
13	D	74	U
13	D	75	A
13	D	76	U
13	D	77	A
13	D	79	C
13	D	80	G
13	D	81	A
13	D	82	A
13	D	84	A
13	D	90	C
13	D	92	U
13	D	94	C
13	D	101	C
13	D	104	G
13	D	113	G
13	D	127	U
13	D	164	C
13	D	165	A
13	D	166	U
13	D	170	U
13	D	171	U
13	D	172	U
13	D	173	U
13	D	174	G
13	D	175	G
14	E	12	A
14	E	13	A
14	E	14	C

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
14	E	15	C
14	E	16	C
14	E	33	C
14	E	34	A
14	E	36	U
14	E	37	U
14	E	39	G
14	E	43	C
14	E	50	G
14	E	51	A
14	E	54	U
14	E	57	U
14	E	60	G
14	E	62	A
14	E	65	U
14	E	66	C
14	E	67	C
14	E	68	C
14	E	73	A
14	E	74	U
14	E	75	A
14	E	80	U
14	E	81	G
14	E	85	C
14	E	86	G
14	E	87	U
14	E	89	U
14	E	90	U
14	E	91	A
14	E	92	C
15	L	16	U
15	L	17	U
15	L	18	U
15	L	19	U
15	L	20	G
15	L	21	G
15	L	25	A
15	L	26	G
15	L	29	C
15	L	30	A
15	L	31	A
15	L	34	G

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
15	L	39	A
15	L	41	C
15	L	42	U
15	L	49	U
15	L	111	C
15	L	115	U
15	L	116	U
15	L	117	U
15	L	118	U
15	L	119	G
15	L	120	G
15	L	1099	G
15	L	1107	C
15	L	1108	A
15	L	1111	U
15	L	1112	G
15	L	1114	G
15	L	1120	G
16	M	484	U
16	M	485	U
16	M	486	A
16	M	487	A
16	M	492	U
16	M	494	G
16	M	495	A
16	M	496	U
16	M	497	A
16	M	500	A
16	M	501	A
16	M	502	C
16	M	503	A
33	b	-4	U
33	b	-3	A
33	b	-2	U
33	b	0	G
33	b	1	U
33	b	2	U
33	b	3	U
33	b	4	U
33	b	5	U
33	b	6	U
33	b	7	U

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Mol	Chain	Res	Type
33	b	8	A

All (21) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
12	N	108	U
13	D	78	A
13	D	83	C
13	D	172	U
14	E	14	C
14	E	42	A
14	E	51	A
14	E	53	A
14	E	56	A
14	E	64	U
15	L	17	U
15	L	29	C
15	L	30	A
15	L	40	U
15	L	41	C
15	L	117	U
15	L	1107	C
15	L	1111	U
16	M	483	U
16	M	494	G
16	M	499	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 13 ligands modelled in this entry, 12 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
36	GTP	C	1500	37	26,34,34	1.67	4 (15%)	32,54,54	2.18	10 (31%)

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
36	GTP	C	1500	37	-	5/18/38/38	0/3/3/3

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
36	C	1500	GTP	C5-C6	-5.41	1.36	1.47
36	C	1500	GTP	C5-C4	-2.27	1.37	1.43
36	C	1500	GTP	O4'-C4'	-2.16	1.40	1.45
36	C	1500	GTP	C2'-C1'	-2.15	1.50	1.53

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
36	C	1500	GTP	PA-O3A-PB	-6.36	111.02	132.83
36	C	1500	GTP	PB-O3B-PG	-6.30	111.20	132.83
36	C	1500	GTP	O3G-PG-O3B	3.08	114.95	104.64
36	C	1500	GTP	C2-N1-C6	-3.00	119.57	125.10
36	C	1500	GTP	C8-N7-C5	2.75	108.23	102.99
36	C	1500	GTP	C3'-C2'-C1'	2.45	104.66	100.98
36	C	1500	GTP	C5-C6-N1	2.30	118.02	113.95
36	C	1500	GTP	O4'-C4'-C5'	-2.13	102.36	109.37
36	C	1500	GTP	PA-O5'-C5'	-2.03	109.75	121.68
36	C	1500	GTP	O6-C6-C5	-2.01	120.44	124.37

There are no chirality outliers.

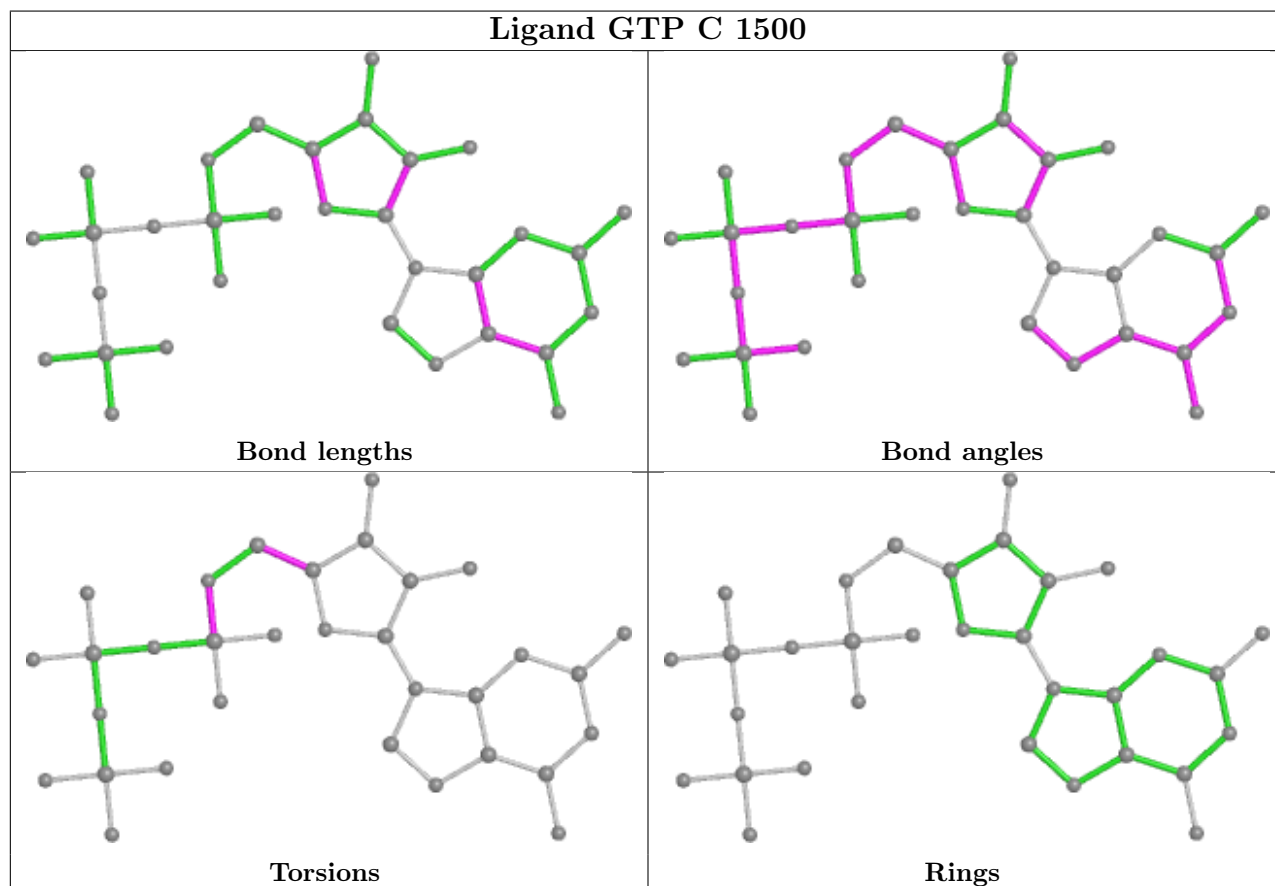
All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
36	C	1500	GTP	C5'-O5'-PA-O3A
36	C	1500	GTP	O4'-C4'-C5'-O5'
36	C	1500	GTP	C3'-C4'-C5'-O5'
36	C	1500	GTP	C5'-O5'-PA-O1A
36	C	1500	GTP	C5'-O5'-PA-O2A

There are no ring outliers.

No monomer is involved in short contacts.

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



## 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.

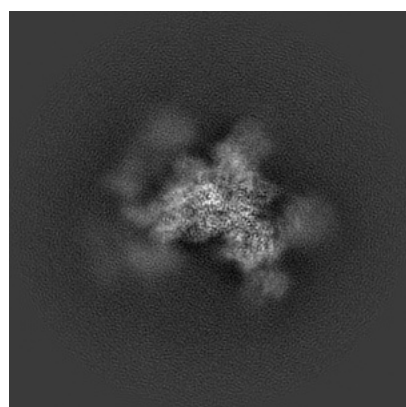
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-6684. These allow visual inspection of the internal detail of the map and identification of artifacts.

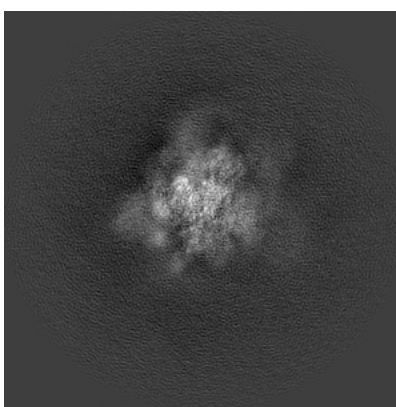
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

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

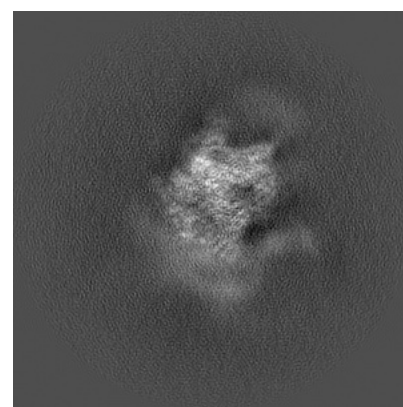
#### 6.1.1 Primary map



X



Y

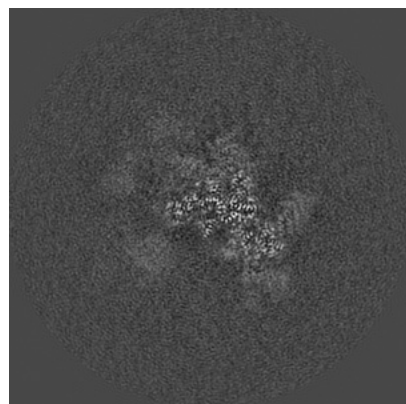


Z

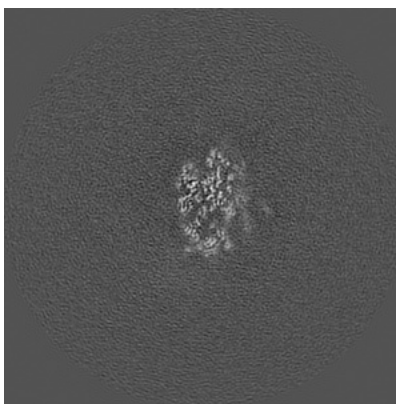
The images above show the map projected in three orthogonal directions.

### 6.2 Central slices [i](#)

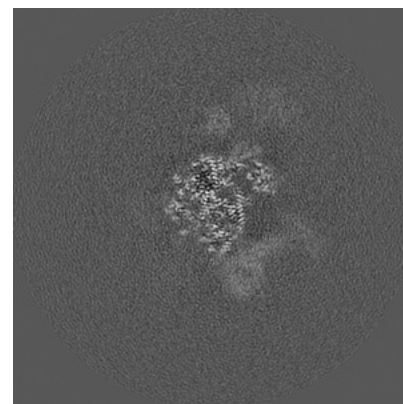
#### 6.2.1 Primary map



X Index: 200



Y Index: 200

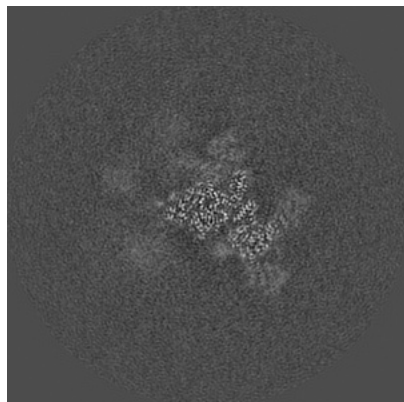


Z Index: 200

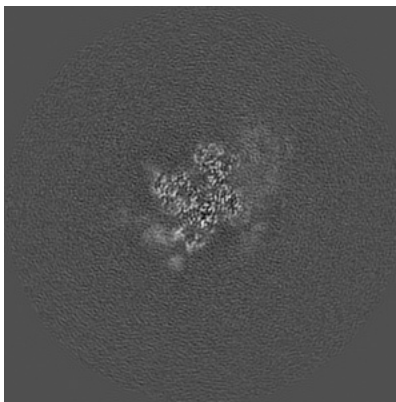
The images above show central slices of the map in three orthogonal directions.

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

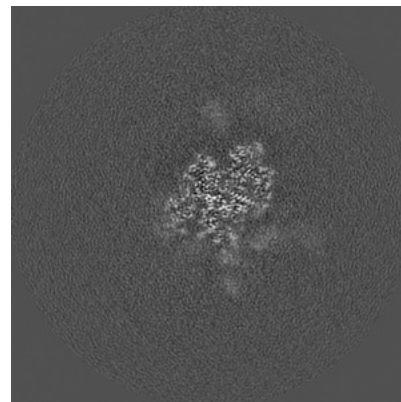
### 6.3.1 Primary map



X Index: 206



Y Index: 231

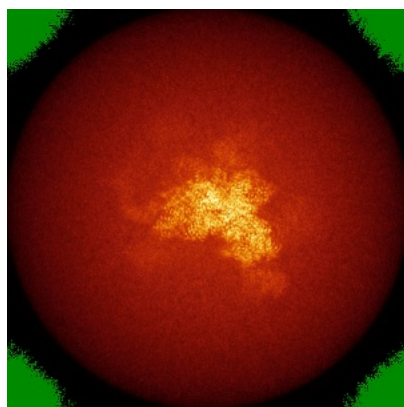


Z Index: 208

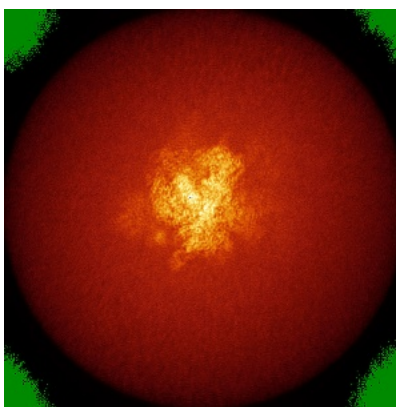
The images above show the largest variance slices of the map in three orthogonal directions.

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

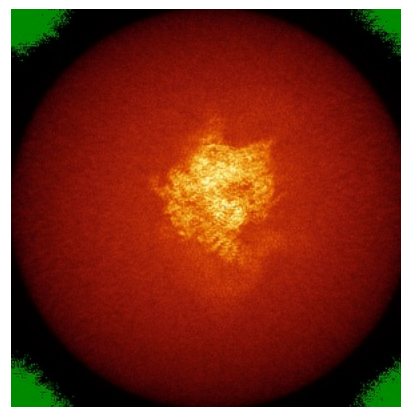
### 6.4.1 Primary map



X



Y



Z

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

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

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.0297. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

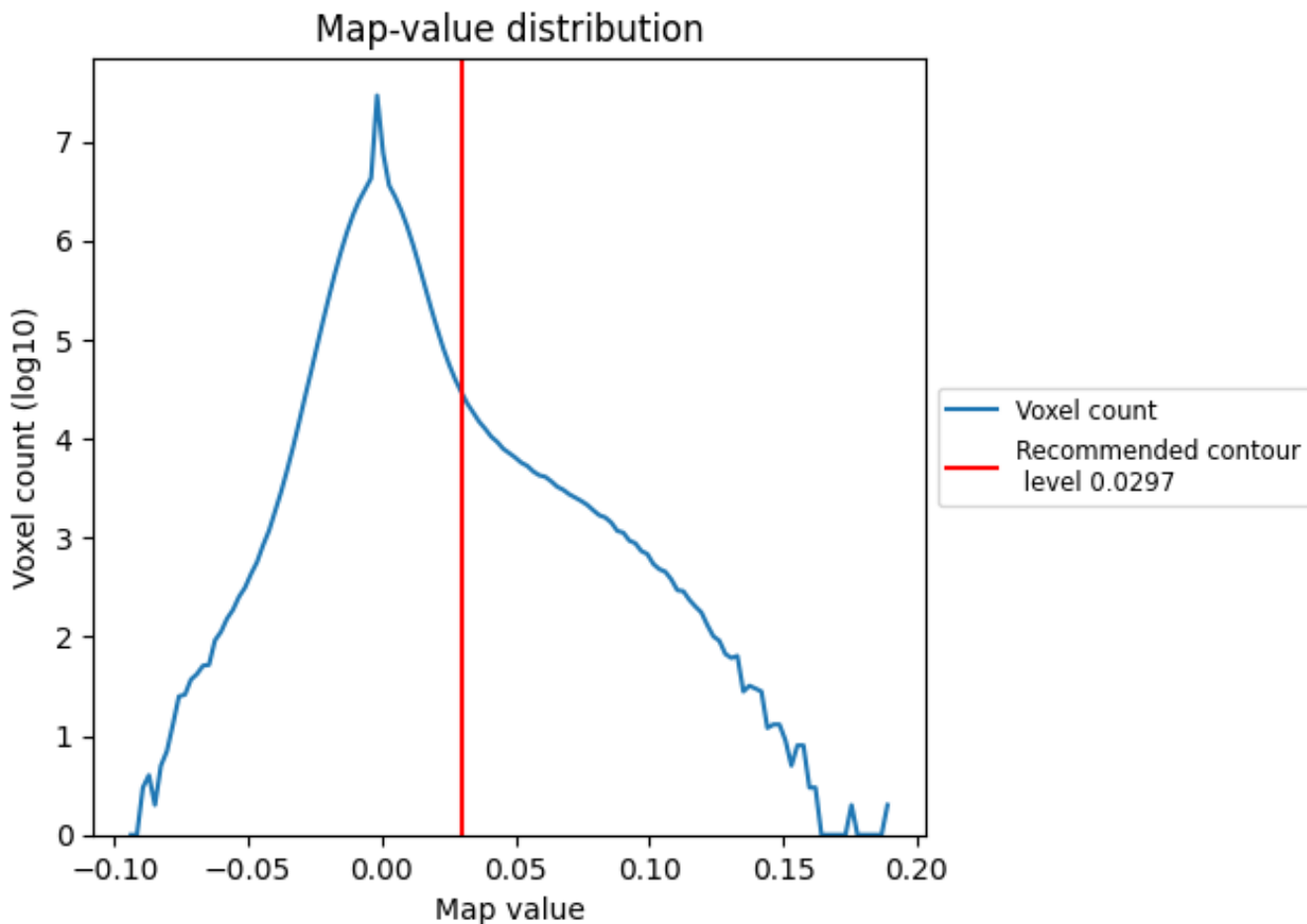
## 6.6 Mask visualisation [i](#)

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

## 7 Map analysis [i](#)

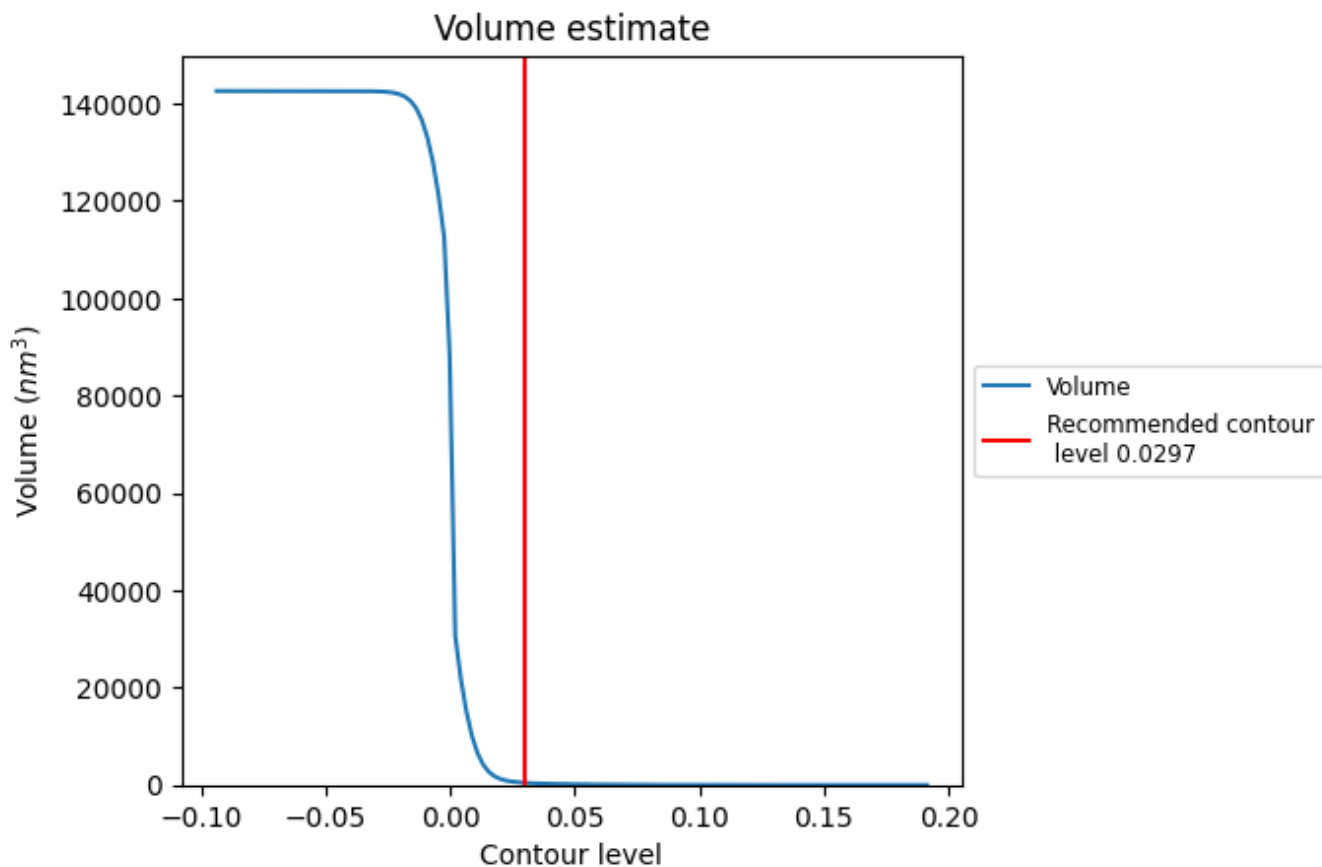
This section contains the results of statistical analysis of the map.

### 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](#)

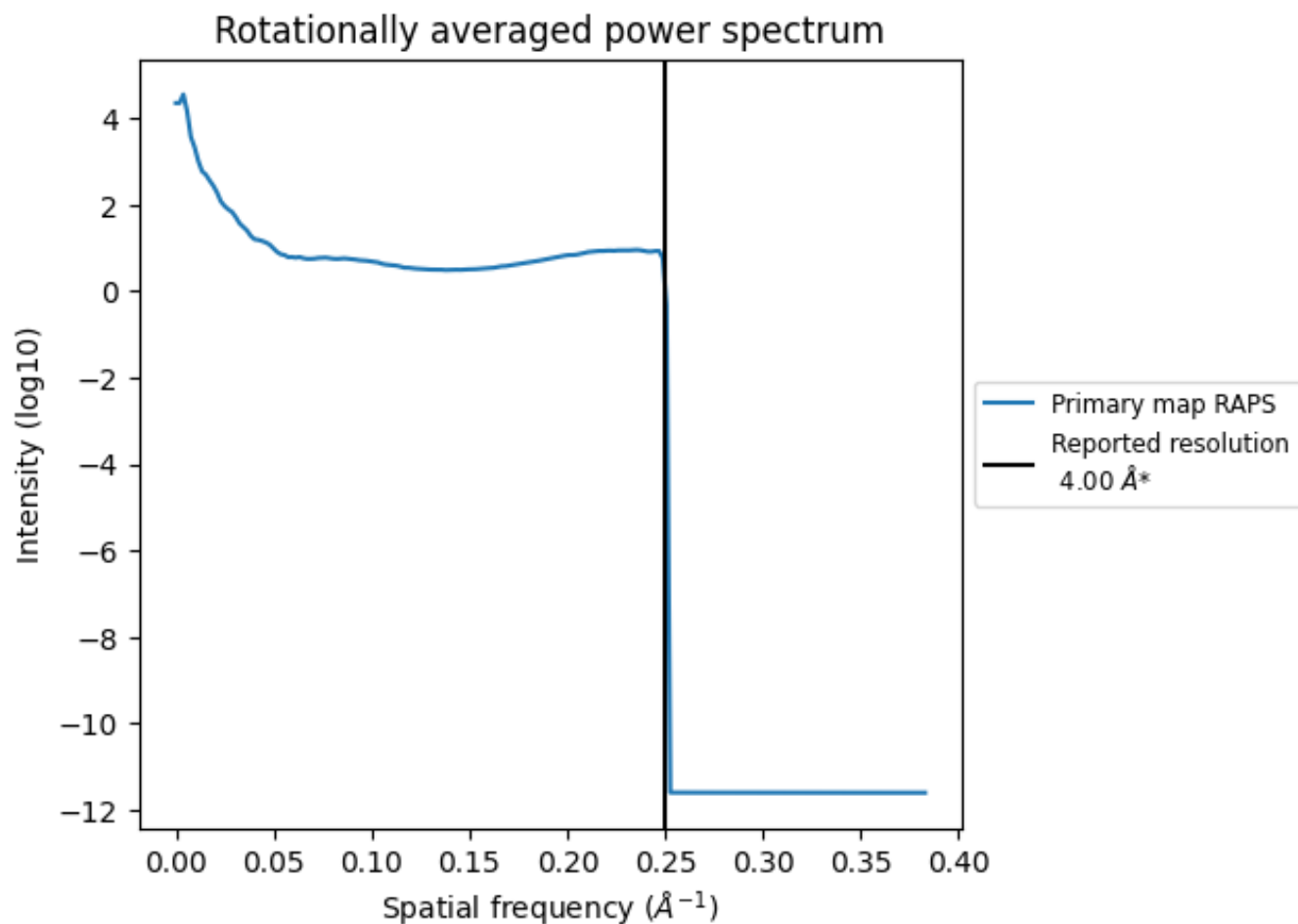


The volume at the recommended contour level is  $445 \text{ nm}^3$ ; this corresponds to an approximate mass of 402 kDa.

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  $0.250 \text{\AA}^{-1}$

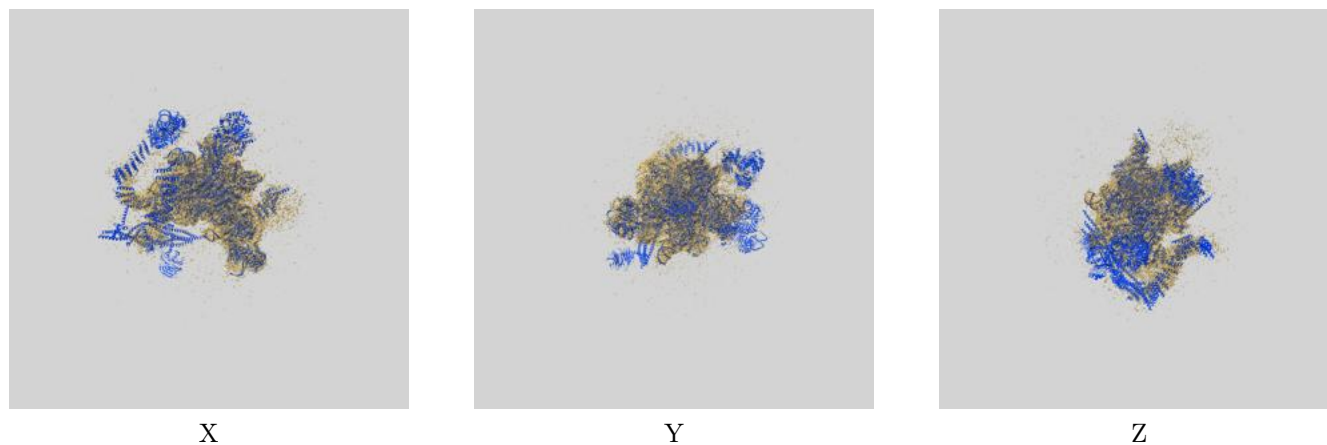
## 8 Fourier-Shell correlation

This section was not generated. No FSC curve or half-maps provided.

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

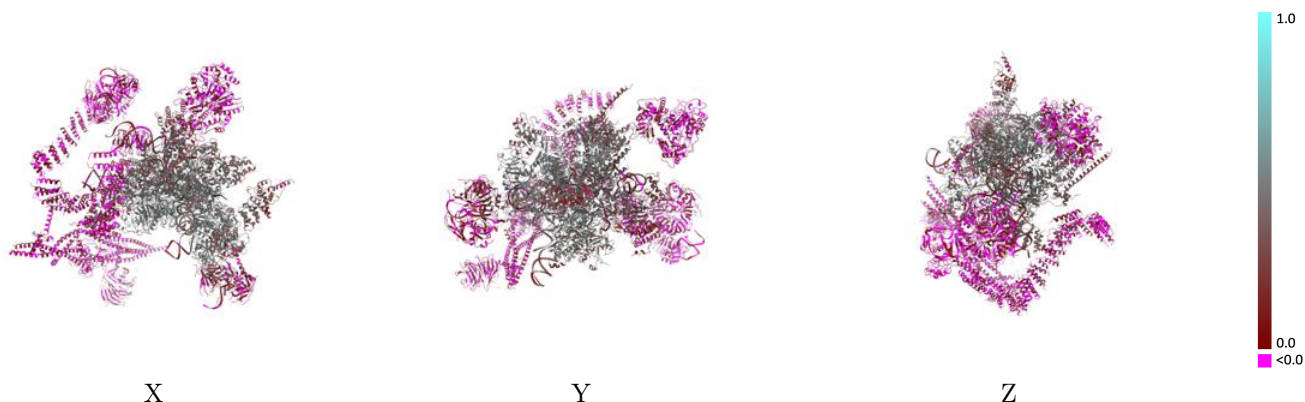
This section contains information regarding the fit between EMDB map EMD-6684 and PDB model 5WSG. Per-residue inclusion information can be found in section [3](#) on page [12](#).

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



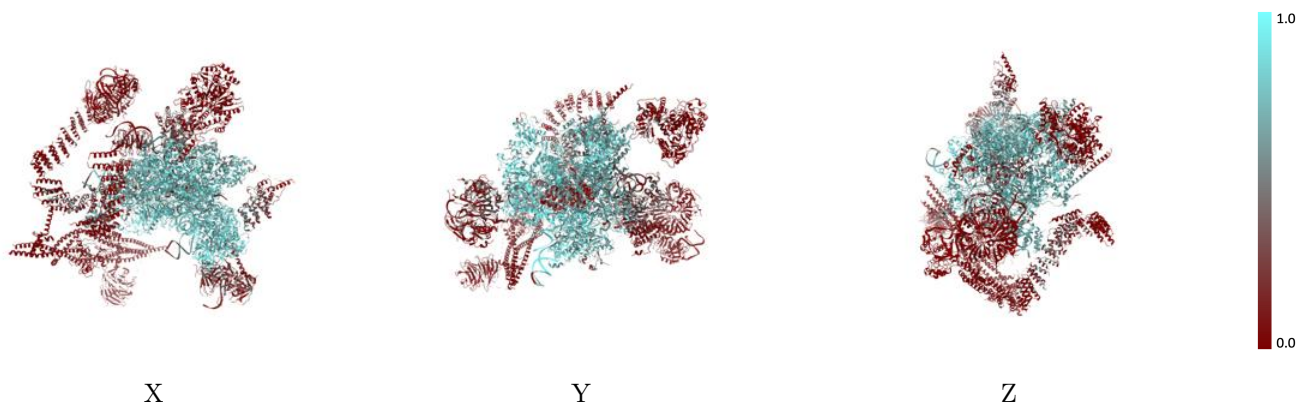
The images above show the 3D surface view of the map at the recommended contour level 0.0297 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



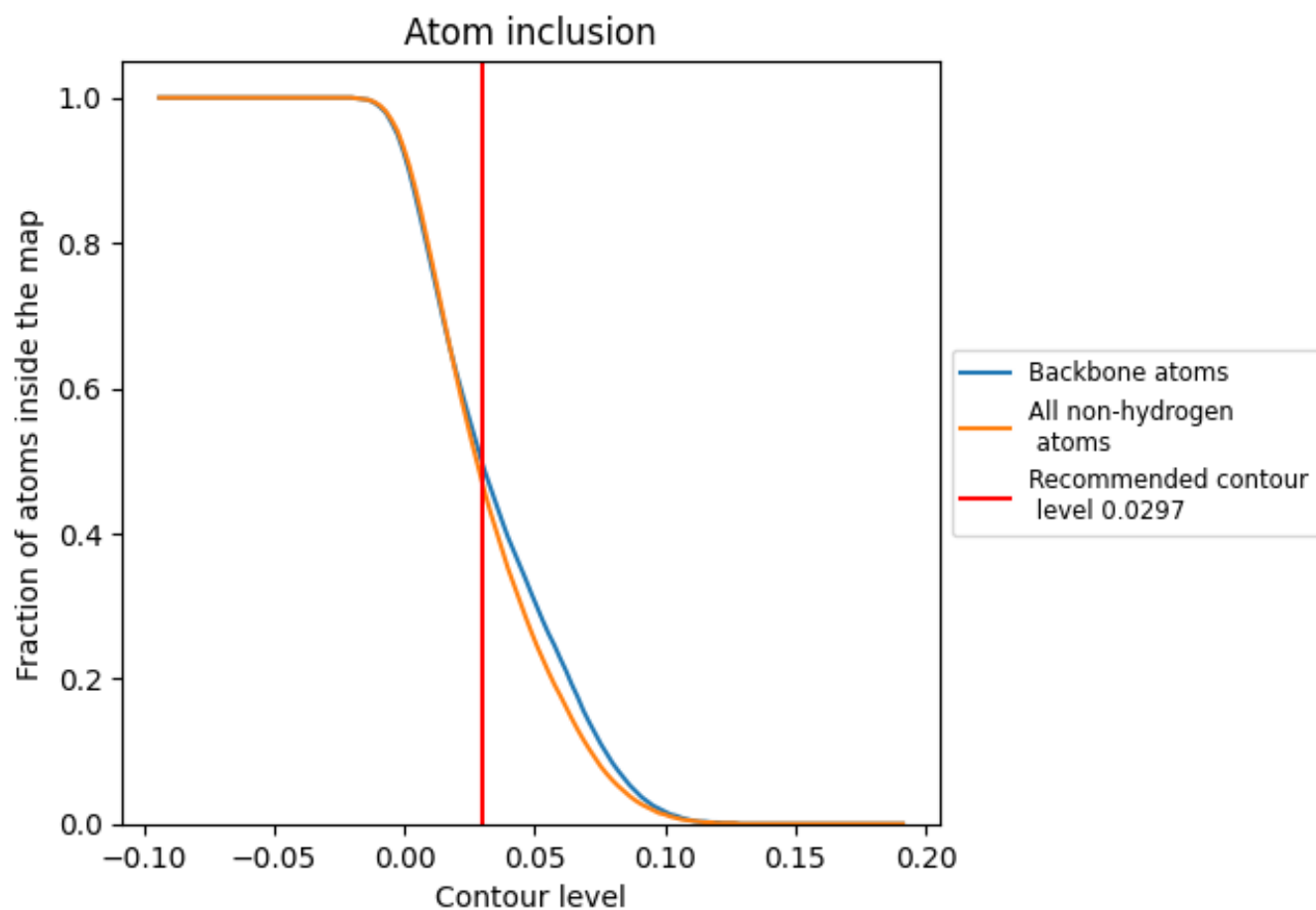
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.0297).







































































## 9.4 Atom inclusion [i](#)



At the recommended contour level, 50% 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 (0.0297) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.4730	 0.2740
A	 0.7330	 0.4410
B	 0.7390	 0.3930
C	 0.8060	 0.4510
D	 0.7220	 0.3140
E	 0.8230	 0.3420
F	 0.0020	 0.0070
G	 0.0040	 0.0080
H	 0.0000	 -0.0050
I	 0.6190	 0.3700
J	 0.7540	 0.4820
K	 0.0000	 -0.0030
L	 0.3220	 0.1470
M	 0.2550	 0.1390
N	 0.7080	 0.3270
O	 0.8350	 0.4860
P	 0.6520	 0.4210
Q	 0.6310	 0.4150
R	 0.7640	 0.4190
S	 0.6410	 0.4670
T	 0.7980	 0.4470
U	 0.0020	 -0.0170
V	 0.0020	 -0.0300
W	 0.0040	 0.0200
X	 0.0020	 0.0070
Y	 0.0000	 -0.0230
Z	 0.4450	 0.3510
b	 0.2600	 0.3130
c	 0.4110	 0.2380
d	 0.4710	 0.2350
e	 0.0370	 0.0300
f	 0.1000	 0.1370
g	 0.1550	 0.1070
h	 0.1620	 0.0520
i	 0.1910	 0.1150



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Chain	Atom inclusion	Q-score
j	 0.2110	 0.1460
k	 0.2060	 0.1700
l	 0.3380	 0.2630
m	 0.1410	 0.0830
n	 0.1980	 0.0690
o	 0.0120	 0.0030
p	 0.0060	 -0.0080
q	 0.0020	 0.0120
r	 0.0280	 0.0490
t	 0.0080	 0.0200
v	 0.1270	 0.0360