



wwPDB EM Validation Summary Report ⓘ

Nov 20, 2022 – 08:00 am GMT

PDB ID : 5GAN
EMDB ID : EMD-8012
Title : The overall structure of the yeast spliceosomal U4/U6.U5 tri-snRNP at 3.7 Angstrom
Authors : Nguyen, T.H.D.; Galej, W.P.; Bai, X.C.; Oubridge, C.; Scheres, S.H.W.; Newman, A.J.; Nagai, K.
Deposited on : 2015-12-15
Resolution : 3.60 Å(reported)

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

We welcome your comments at 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>.

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

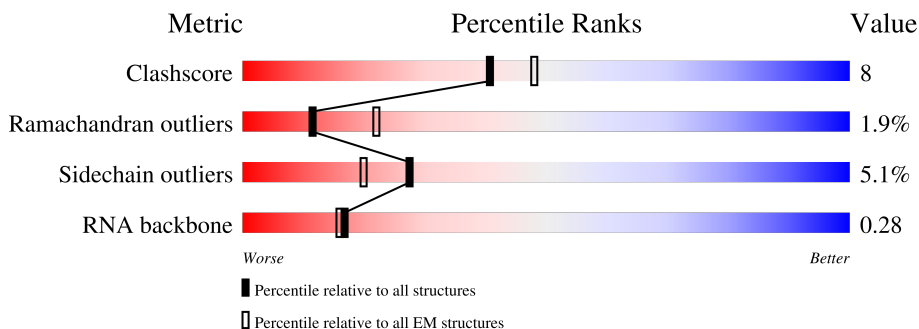
EMDB validation analysis : 0.0.1.dev43
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.9
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.31.2

1 Overall quality at a glance

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

The reported resolution of this entry is 3.60 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)
Clashscore	158937	4297
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 ≥ 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	V	160	
2	W	112	
3	A	2413	
4	H	465	
5	J	899	
6	D	143	
7	F	494	




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Mol	Chain	Length	Quality of chain
8	G	469	9% 55% 11% 32%
9	B	2163	68% 71% 10% 18%
10	x	100	12% 100%
11	b	196	26% 41% 59%
11	k	196	41% 38% 59%
12	h	146	39% 54% 44%
12	l	146	62% 58% 38%
13	j	110	70% 82% 15%
13	m	110	85% 83% 15%
14	d	101	34% 78% 19%
14	n	101	81% 78% 19%
15	e	94	60% 73% 6% 20%
15	p	94	80% 74% 5% 20%
16	f	86	64% 80% 16%
16	q	86	84% 83% 16%
17	g	77	55% 88% 10%
17	r	77	90% 88% 10%
18	E	328	96% 99%
19	U	214	12% 23% 25% 17% 34%
20	K	126	60% 95% 34%
21	2	95	73% 87% 21% 5%
22	3	89	79% 7% 13%
23	4	187	40% 37% 60%
24	5	93	81% 76% 19%
25	6	86	86% 80% 6% 14%

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Mol	Chain	Length	Quality of chain
26	7	115	
27	8	109	
28	C	1008	

2 Entry composition i

There are 29 unique types of molecules in this entry. The entry contains 77370 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 RNA chain called U4 snRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
1	V	124	2635	1179	459	873	124	0	0

- Molecule 2 is a RNA chain called U6 snRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
2	W	80	1697	759	293	565	80	0	0

- Molecule 3 is a protein called Pre-mRNA-splicing factor 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	A	2196	17778	11444	3045	3226	63	0	0

- Molecule 4 is a protein called U4/U6 small nuclear ribonucleoprotein PRP4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	H	357	2789	1743	501	532	13	0	0

- Molecule 5 is a protein called Pre-mRNA-splicing factor 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	J	729	5822	3726	992	1079	25	0	0

- Molecule 6 is a protein called Spliceosomal protein DIB1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	D	140	1151	728	200	212	11	0	0

- Molecule 7 is a protein called Pre-mRNA-processing factor 31.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	F	415	3218	2052	575	580	11	0	0

- Molecule 8 is a protein called U4/U6 small nuclear ribonucleoprotein PRP3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
8	G	318	2632	1659	469	488	16	0	0

- Molecule 9 is a protein called Pre-mRNA-splicing helicase BRR2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	B	1781	14212	9098	2372	2685	57	1	0

- Molecule 10 is a protein called Unknown protein.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
10	x	100	500	300	100	100	0	0

- Molecule 11 is a protein called Small nuclear ribonucleoprotein-associated protein B.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
11	k	80	631	403	114	111	3	0	0
11	b	80	631	403	114	111	3	0	0

- Molecule 12 is a protein called Small nuclear ribonucleoprotein Sm D1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
12	l	91	720	455	129	134	2	0	0
12	h	82	644	409	110	123	2	0	0

- Molecule 13 is a protein called Small nuclear ribonucleoprotein Sm D2.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	m	94	Total	C	N	O	S	0	0
			737	474	140	119	4		
13	j	94	Total	C	N	O	S	0	0
			741	477	141	119	4		

- Molecule 14 is a protein called Small nuclear ribonucleoprotein Sm D3.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	n	82	Total	C	N	O	S	0	0
			625	399	109	115	2		
14	d	82	Total	C	N	O	S	0	0
			625	399	109	115	2		

- Molecule 15 is a protein called Small nuclear ribonucleoprotein E.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	p	75	Total	C	N	O	S	0	0
			575	379	92	101	3		
15	e	75	Total	C	N	O	S	0	0
			575	379	92	101	3		

- Molecule 16 is a protein called Small nuclear ribonucleoprotein F.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	q	72	Total	C	N	O	S	0	0
			573	368	101	103	1		
16	f	72	Total	C	N	O	S	0	0
			573	368	101	103	1		

- Molecule 17 is a protein called Small nuclear ribonucleoprotein G.

Mol	Chain	Residues	Atoms					AltConf	Trace
17	r	69	Total	C	N	O	S	0	0
			526	336	93	95	2		
17	g	69	Total	C	N	O	S	0	0
			529	337	93	97	2		

- Molecule 18 is a protein called Snu66.

Mol	Chain	Residues	Atoms				AltConf	Trace
18	E	328	Total	C	N	O	0	0
			1713	1033	342	338		

- Molecule 19 is a RNA chain called U5 snRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
19	U	141	2999	1342	530	986	141	0	0

- Molecule 20 is a protein called 13 kDa ribonucleoprotein-associated protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
20	K	124	936	597	161	174	4	0	0

- Molecule 21 is a protein called U6 snRNA-associated Sm-like protein LSm2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
21	2	90	735	469	124	139	3	0	0

- Molecule 22 is a protein called U6 snRNA-associated Sm-like protein LSm3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
22	3	77	611	382	105	121	3	0	0

- Molecule 23 is a protein called U6 snRNA-associated Sm-like protein LSm4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
23	4	74	588	381	96	108	3	0	0

- Molecule 24 is a protein called U6 snRNA-associated Sm-like protein LSm5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
24	5	75	588	378	98	110	2	0	0

- Molecule 25 is a protein called U6 snRNA-associated Sm-like protein LSm6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
25	6	74	577	364	95	116	2	0	0

- Molecule 26 is a protein called U6 snRNA-associated Sm-like protein LSm7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
26	7	66	504	325	85	91	3	0	0

- Molecule 27 is a protein called U6 snRNA-associated Sm-like protein LSm8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
27	8	64	498	320	86	90	2	0	0

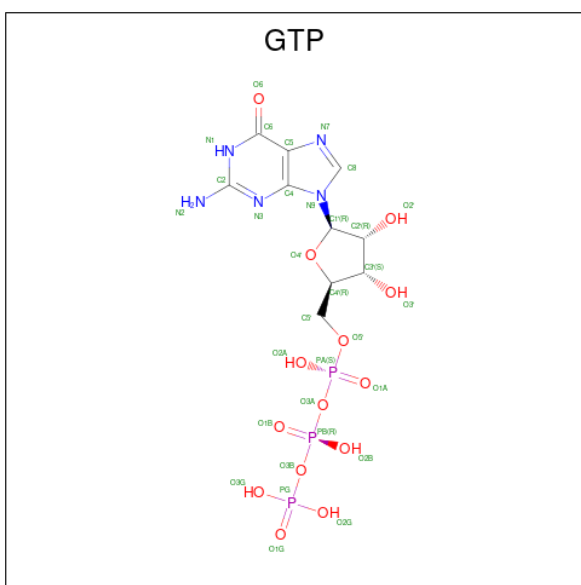
- Molecule 28 is a protein called Pre-mRNA-splicing factor SNU114.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
28	C	855	6450	4195	1089	1143	23	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	530	SER	GLU	conflict	UNP P36048
C	531	LYS	ASP	conflict	UNP P36048
C	532	THR	ASP	conflict	UNP P36048

- Molecule 29 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GTP) (formula: $C_{10}H_{16}N_5O_{14}P_3$).

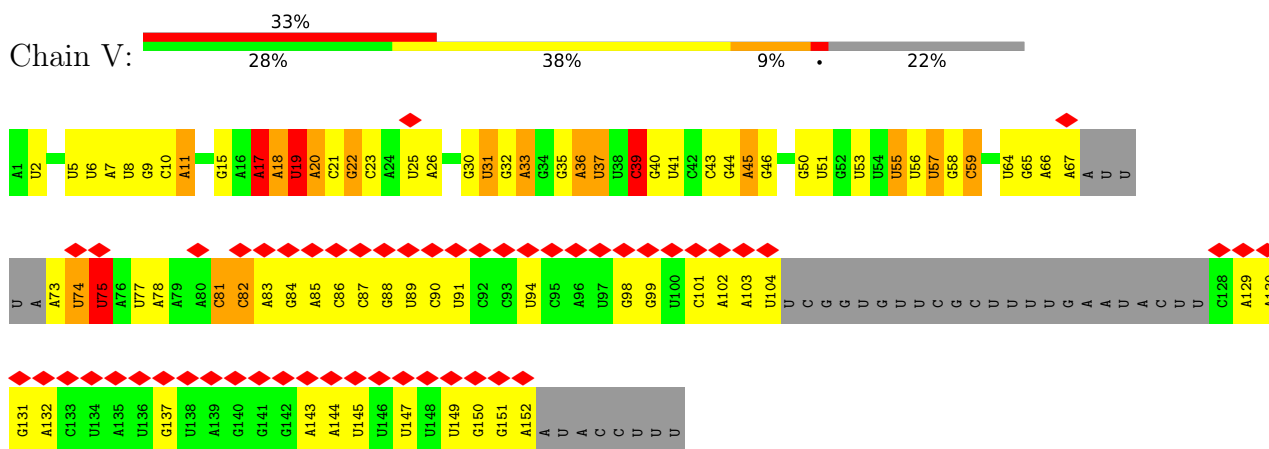


Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
29	C	1	32	10	5	14	3	0

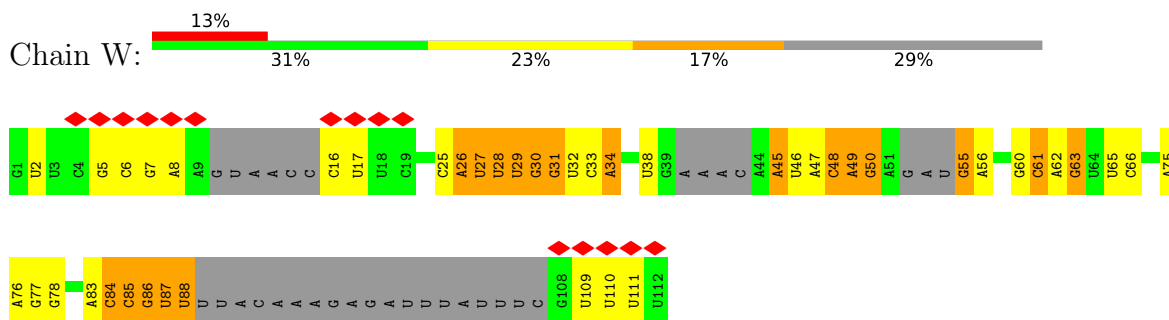
3 Residue-property plots i

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.

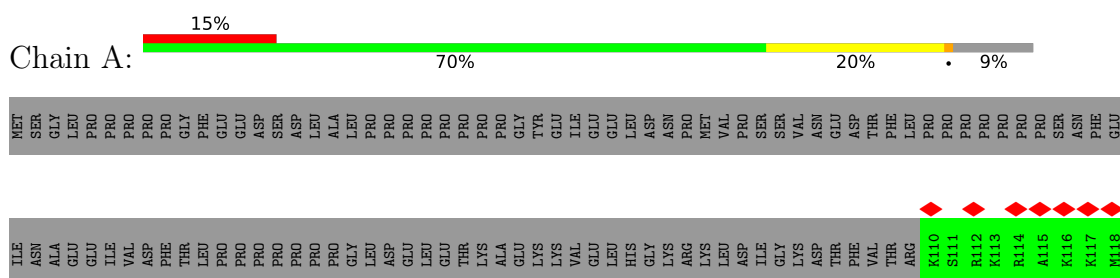
- Molecule 1: U4 snRNA

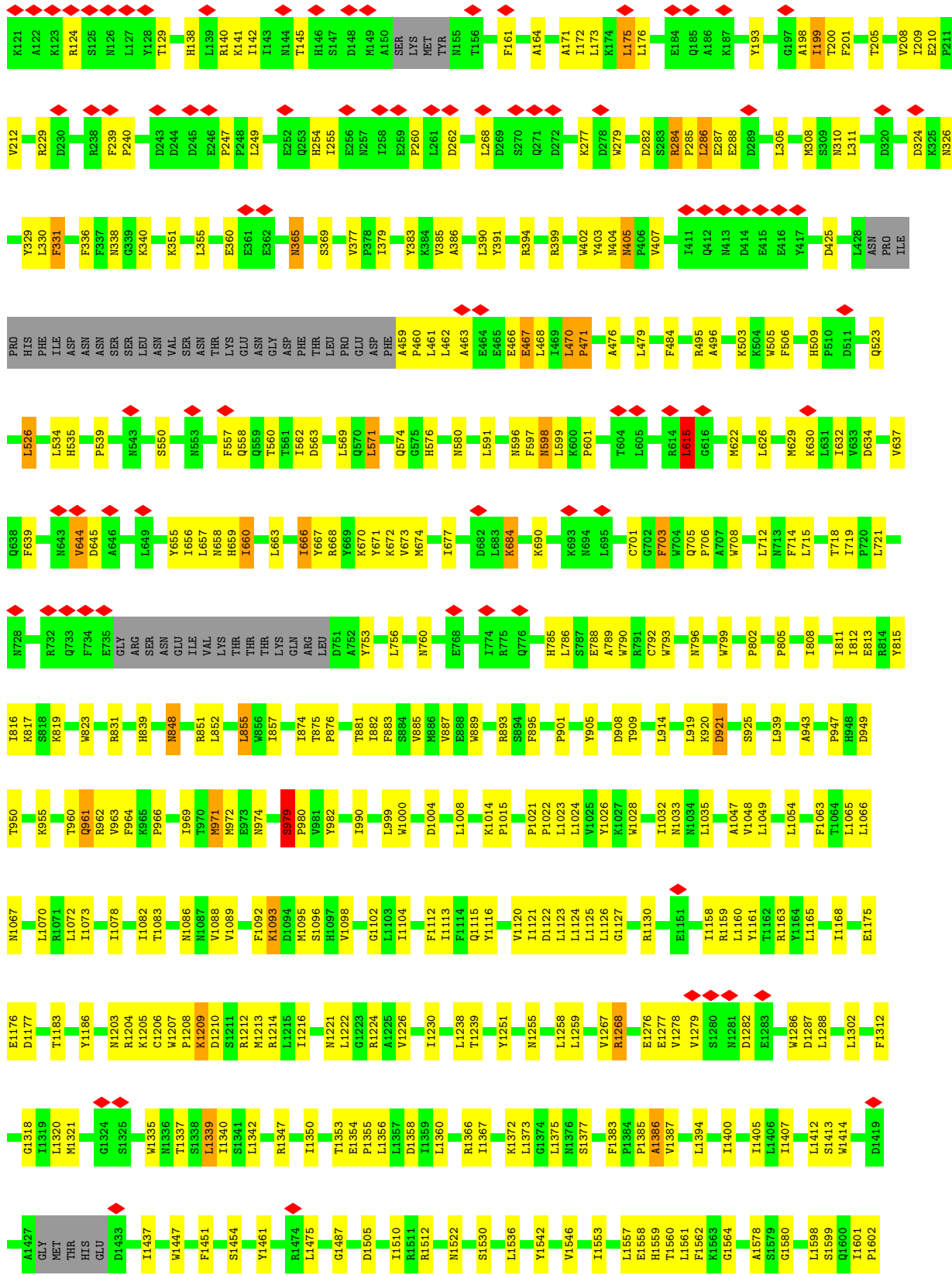


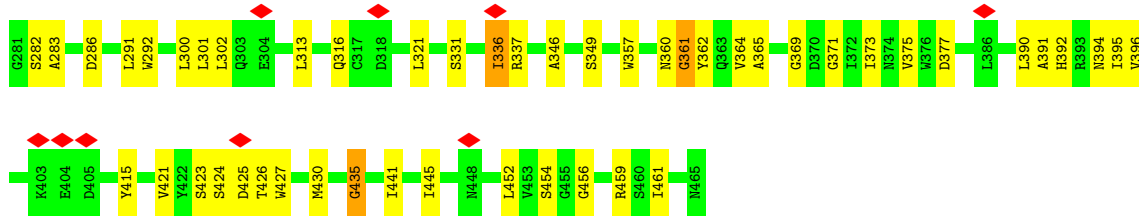
- Molecule 2: U6 snRNA



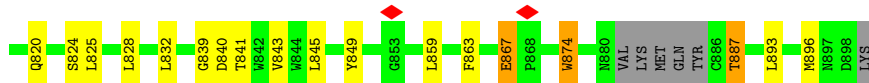
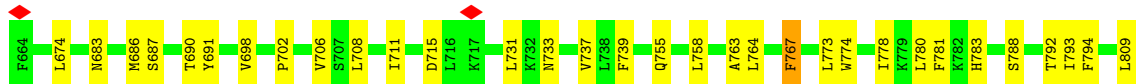
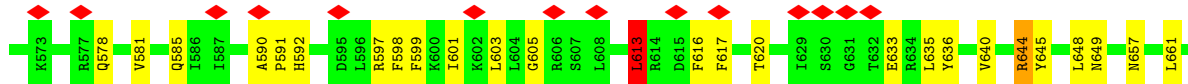
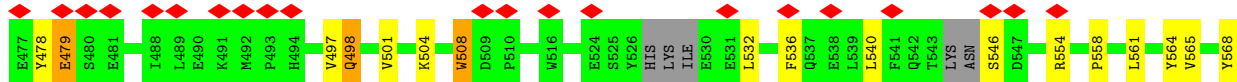
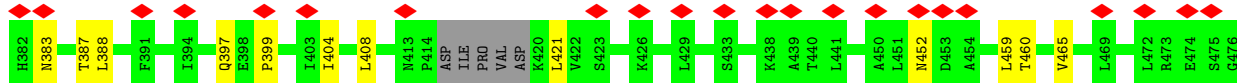
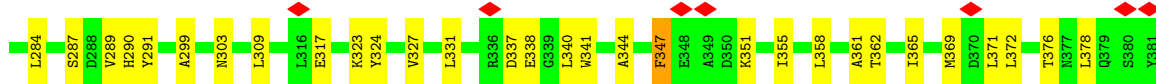
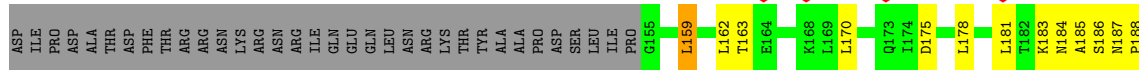
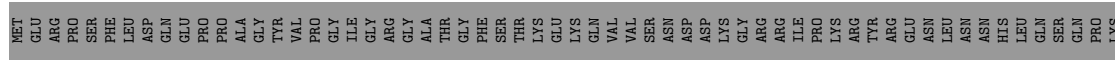
- Molecule 3: Pre-mRNA-splicing factor 8





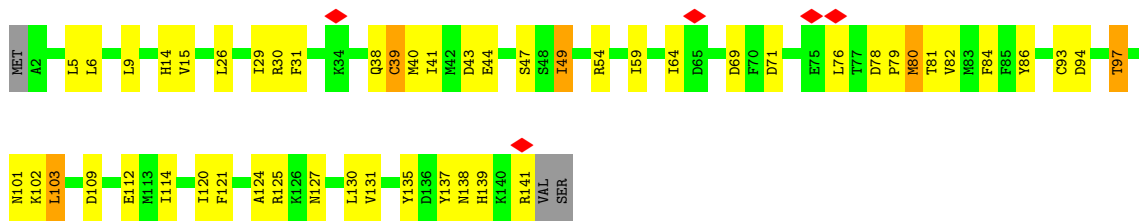


• Molecule 5: Pre-mRNA-splicing factor 6

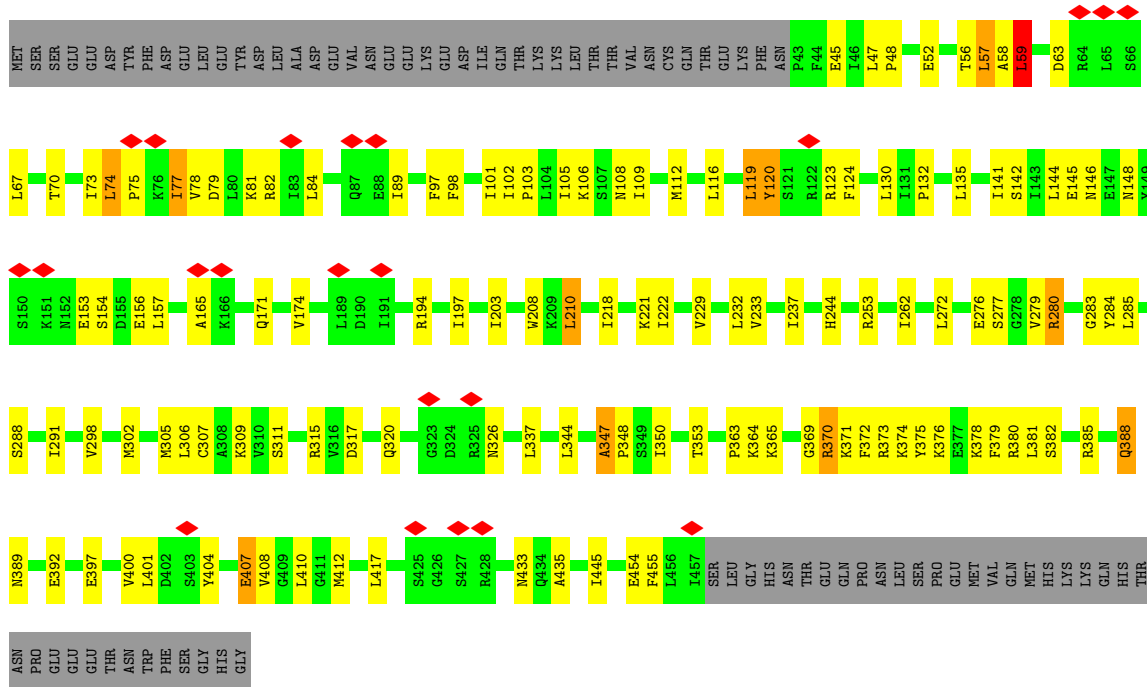


• Molecule 6: Spliceosomal protein DIB1

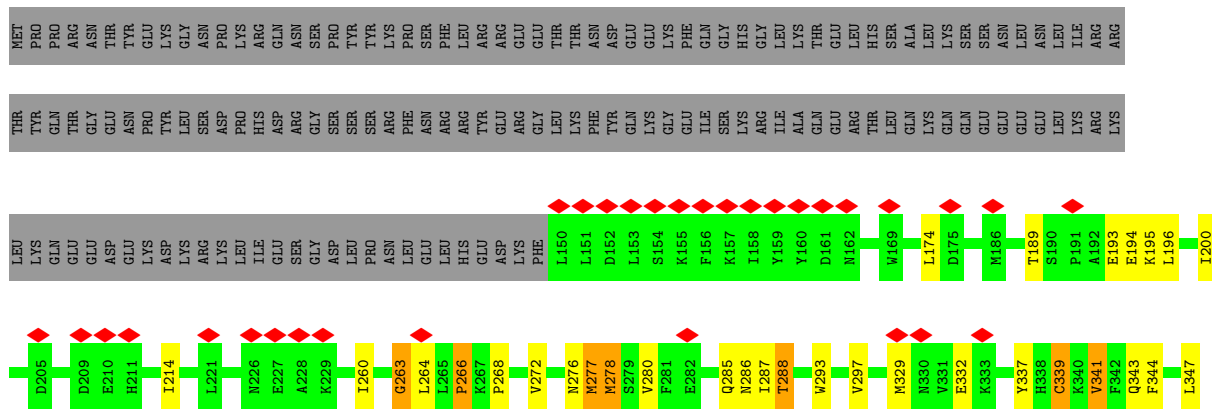


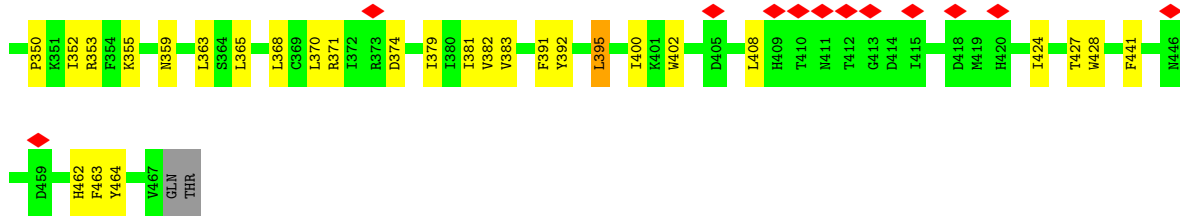


• Molecule 7: Pre-mRNA-processing factor 31

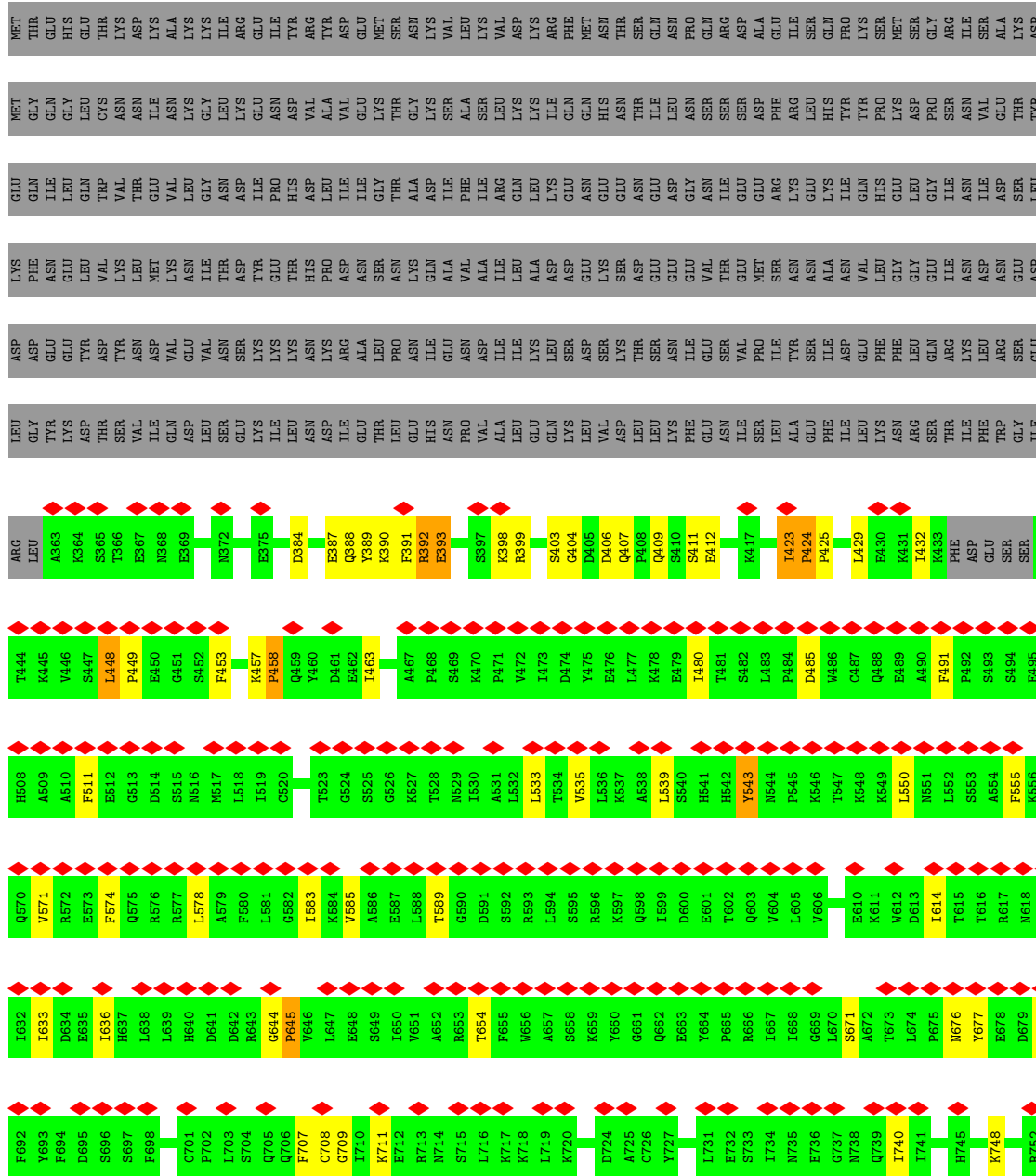


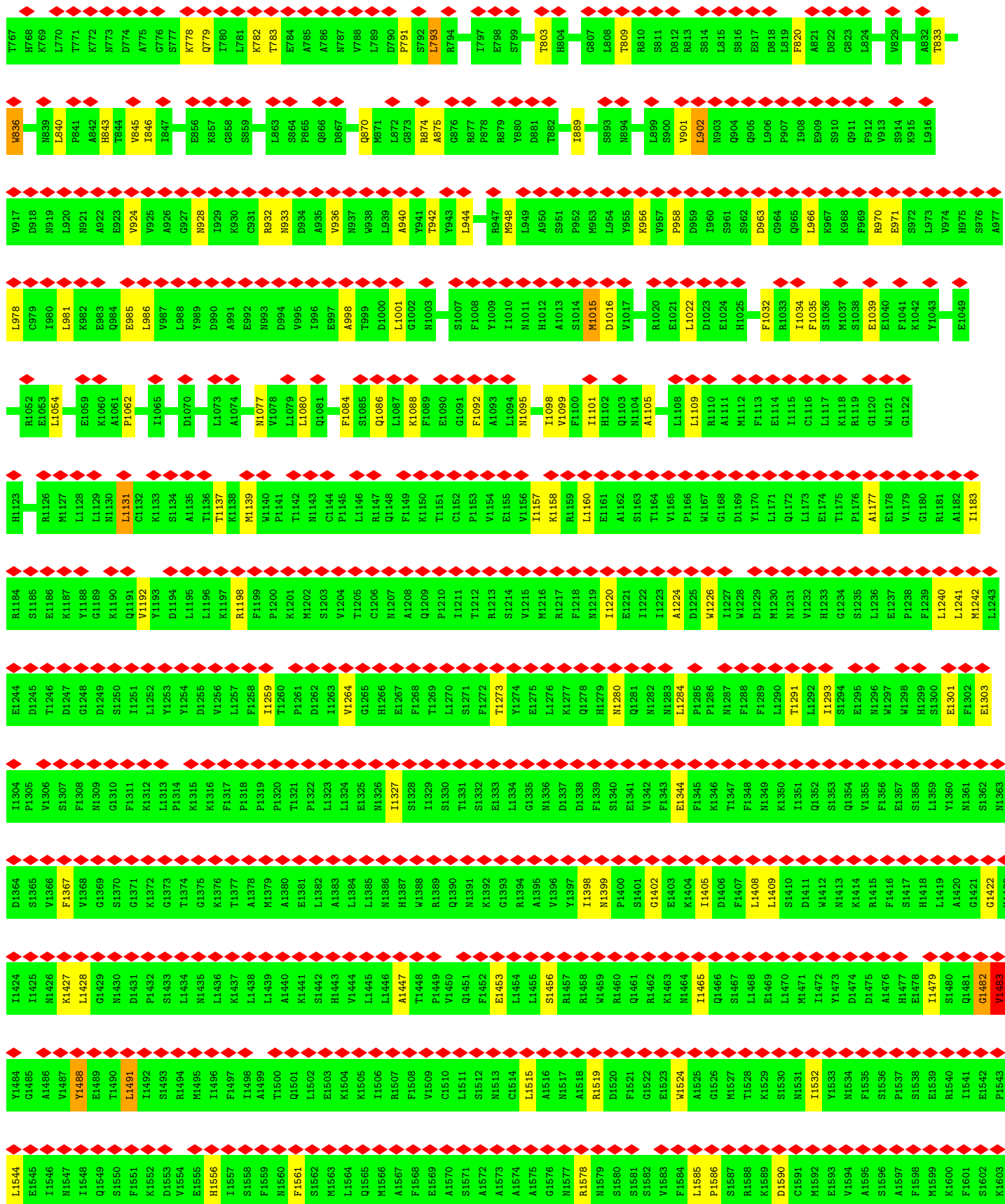
• Molecule 8: U4/U6 small nuclear ribonucleoprotein PRP3





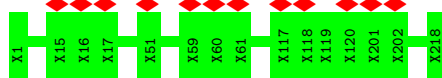
• Molecule 9: Pre-mRNA-splicing helicase BRR2





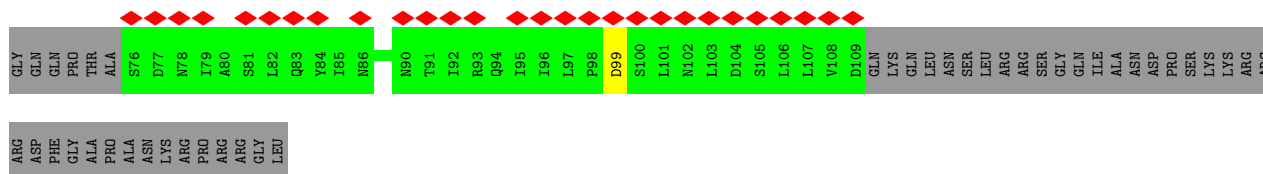
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LI664	LI665	LI666	SI667	KI668	DI669	CI670	SI671	AI672	FI673	AI674	CI675	KI676	TI677	DI678	EI679	VI680	LI681	EI682	LI683	GI684	TI685	NI686	DI687	YI688	DI689	GI690	AI691	EI692	LI693	KI694	YI695	MI696	PI697	YI698	TI699	LI700	LI701	EI702	LI703	LI704	MI706	VI707	GI708	LI709	EI705	AI710	SI711	LI712	GI713	KI714	DI715	LI716	GI717	LI718	KI719	VI720	LI721	LI722	LI723			
TI724	SI725	HI726	MI727	MI728	KI729	AI730	YI731	YI732	KI733	KI734	FI735	LI736	LI737	EI738	PI739	LI740	PI741	TI742	EI743	SI744	YI745	LI746	QI747	YI748	LI749	LI750	HI751	DI752	TI753	LI754	MI755	MI756	EI757	LI758	AI759	MI760	SI761	LI762	LI763	QI764	SI765	KI766	GLU	ALA	VAL	THR	GLU	VAL	ASN	GLY	GLY	ASP	ASP	GLU	ALA	TI841	TI842	TI843				
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LI844	SI845	TI846	LI847	SI848	NI849	GI850	LI851	LI852	AI853	SI854	HI855	YI856	GI857	VI858	SI859	FI860	FI861	TI862	LI863	QI864	SI865	FI866	VI867	SI868	SI869	LI870	SI871	NI872	TI873	SI874	TI875	LI876	LI877	NI878	MI879	LI880	YI881	VI882	LI883	LI884	TI885	AI886	VI887	EI888	FI889	AI890	SI891	VI892	PI893	LI894	LI895	KI896	GI897	LI898	RI899	AI900	LI901	LI902	VI903			
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D2024	E2025	E2026	R2027	D2028	E2029	I2030	L2031	T2032	L2033	T2034	D2035	S2036	Q2037	L2038	A2039	Q2040	V2041	A2042	A2043	F2044	V2045	N2046	N2047	Y2048	P2049	N2050	V2051	E2052	L2053	T2054	Y2055	S2056	L2057	M2058	N2059	S2060	D2061	S2062	L2063	I2064	S2065	G2066	V2067	K2068	Q2069	K2070	I2071	T2072	L2073	Q2074	L2075	T2076	R2077	D2078	V2079	E2080	P2081	E2082	N2083			
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C2144	V2145	C2146	D2147	S2148	Y2149	L2150	D2151	A2152	D2153	K2154	E2155	L2156	S2157	F2158	E2159	I2160	N2161	V2162	K2163																																											

• Molecule 10: Unknown protein

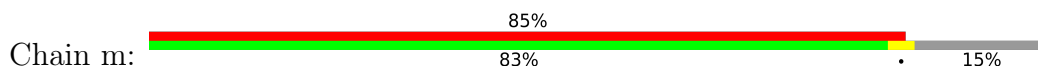


• Molecule 11: Small nuclear ribonucleoprotein-associated protein B

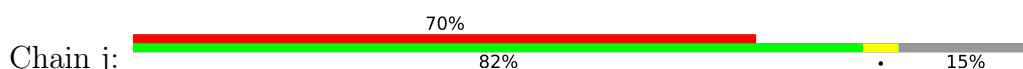




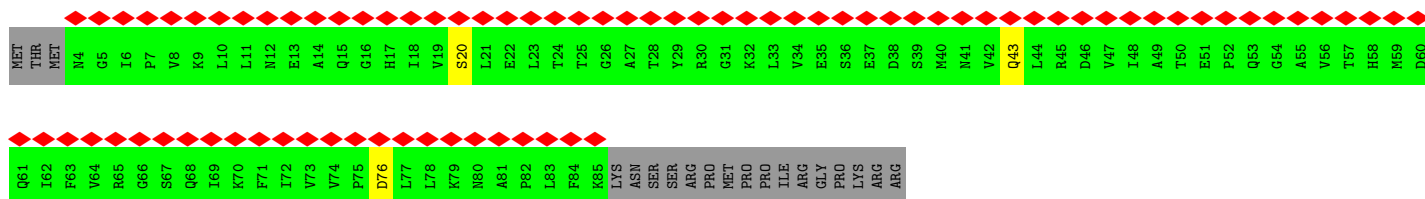
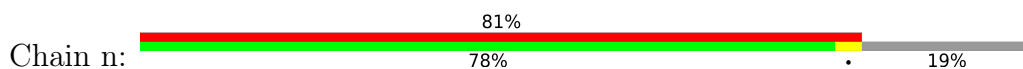
• Molecule 13: Small nuclear ribonucleoprotein Sm D2



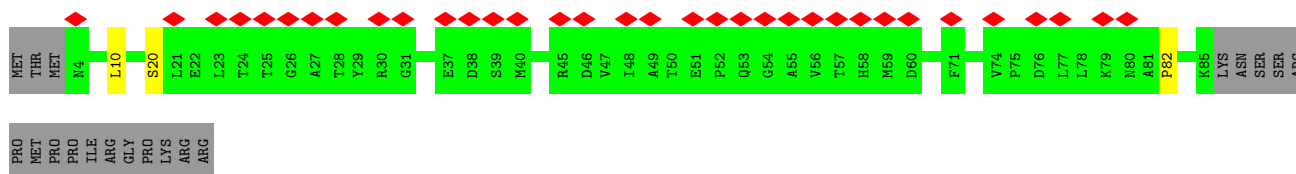
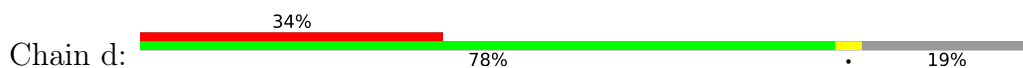
• Molecule 13: Small nuclear ribonucleoprotein Sm D2



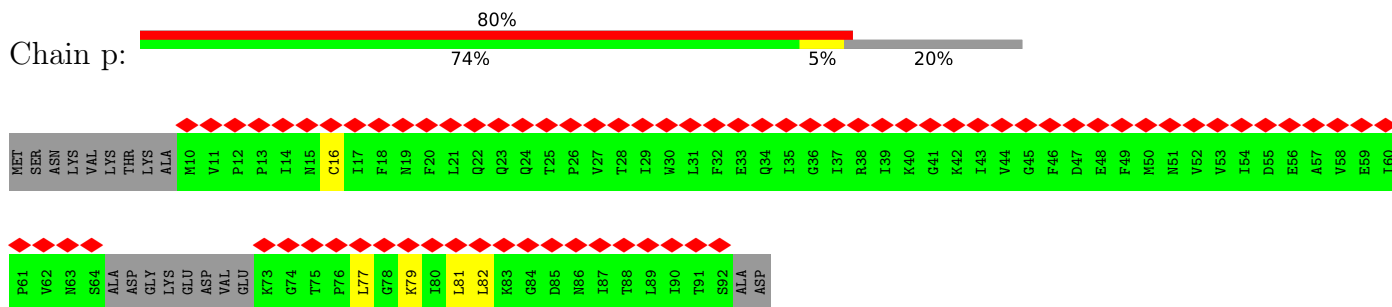
• Molecule 14: Small nuclear ribonucleoprotein Sm D3



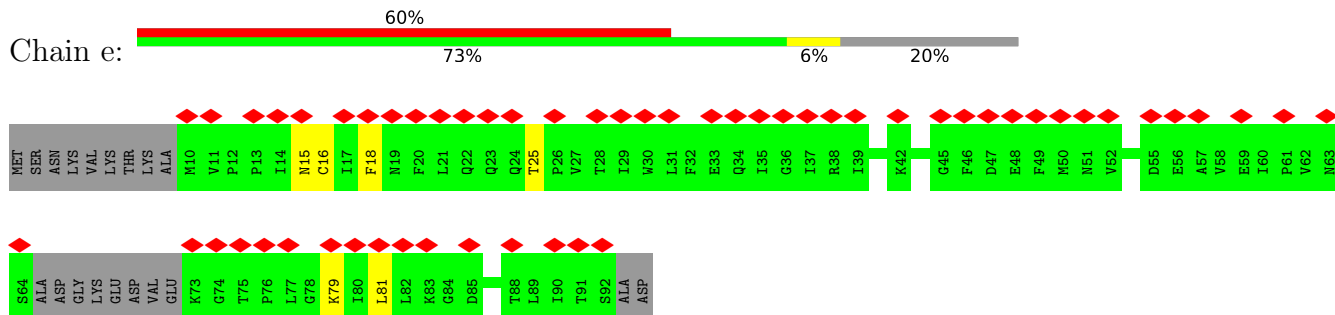
• Molecule 14: Small nuclear ribonucleoprotein Sm D3



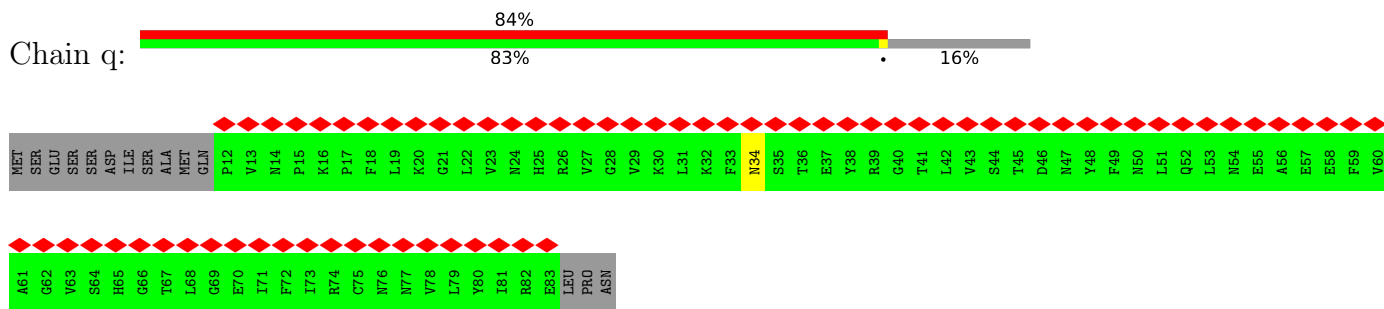
• Molecule 15: Small nuclear ribonucleoprotein E



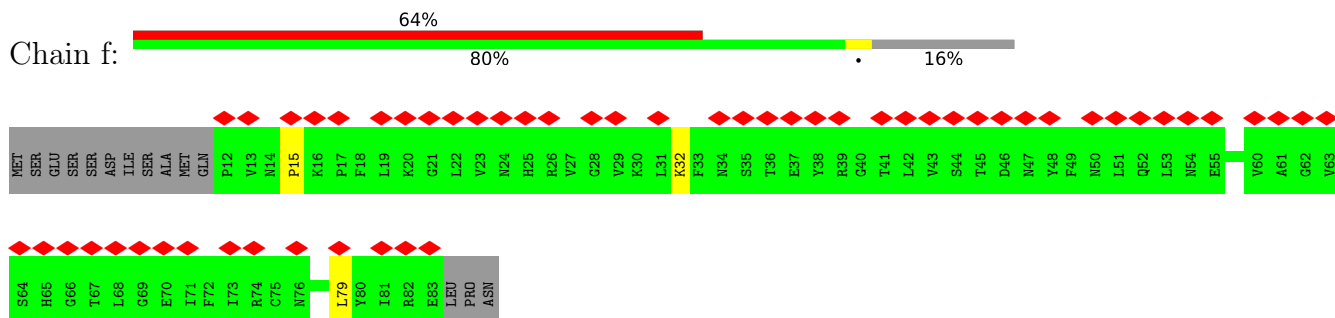
• Molecule 15: Small nuclear ribonucleoprotein E



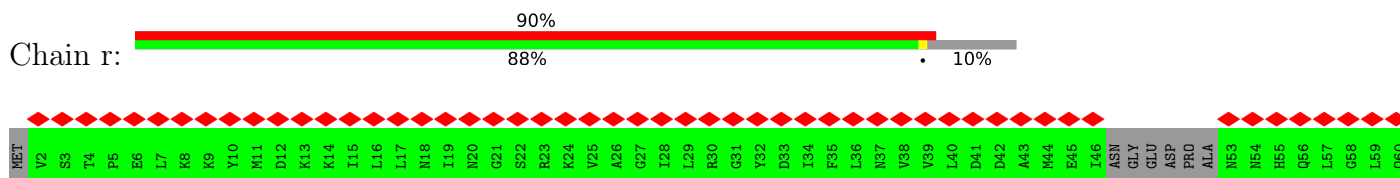
• Molecule 16: Small nuclear ribonucleoprotein F

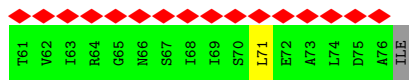


• Molecule 16: Small nuclear ribonucleoprotein F

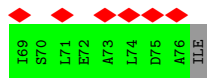
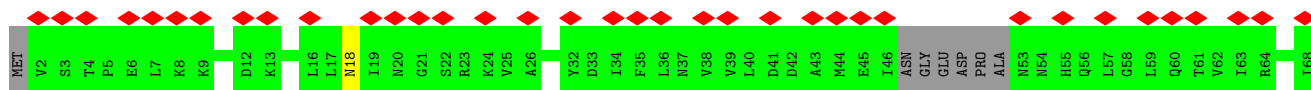
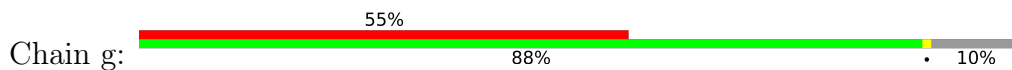


• Molecule 17: Small nuclear ribonucleoprotein G

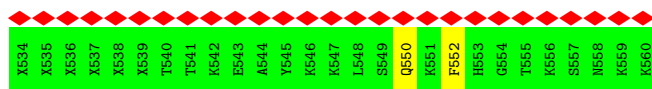
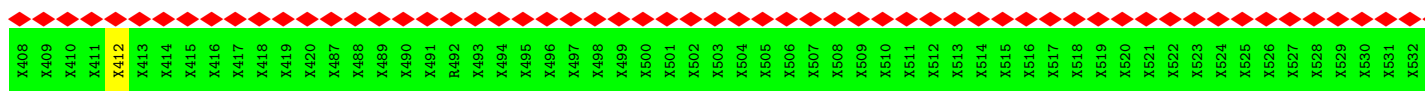
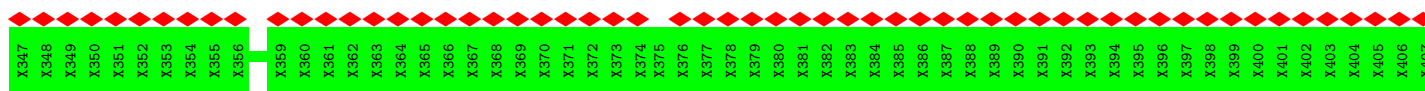
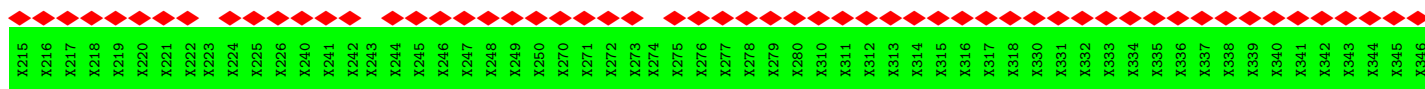
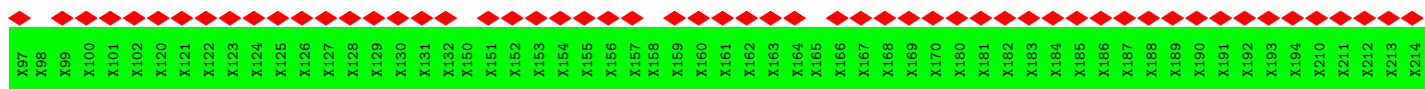
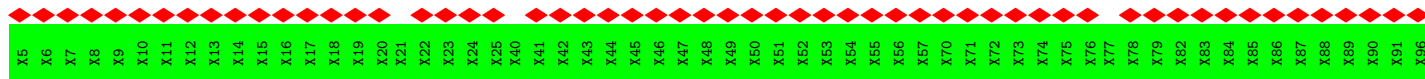




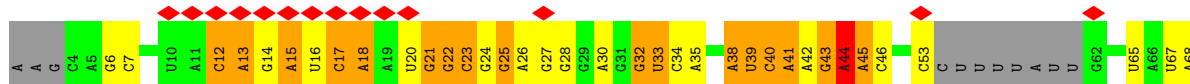
• Molecule 17: Small nuclear ribonucleoprotein G

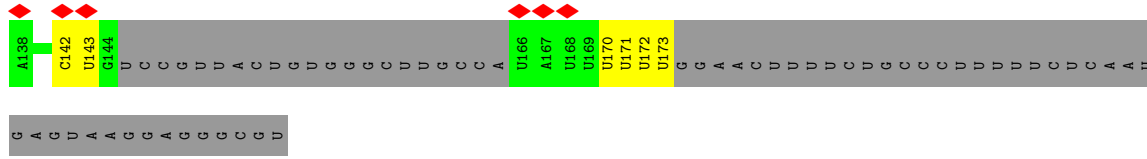


• Molecule 18: Snu66

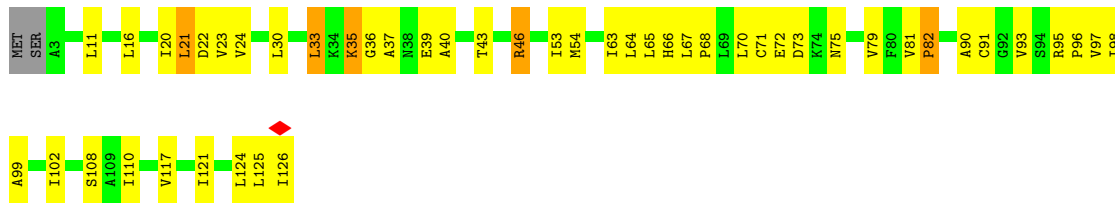


• Molecule 19: U5 snRNA

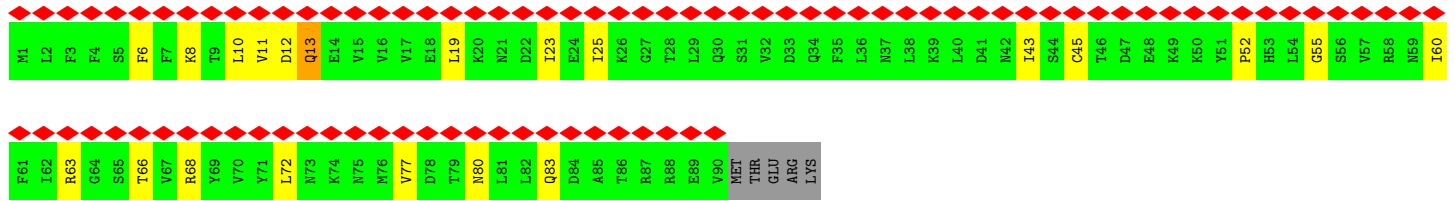
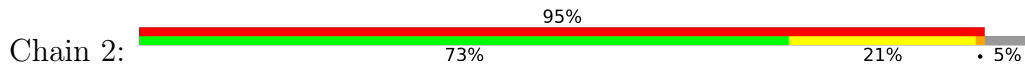




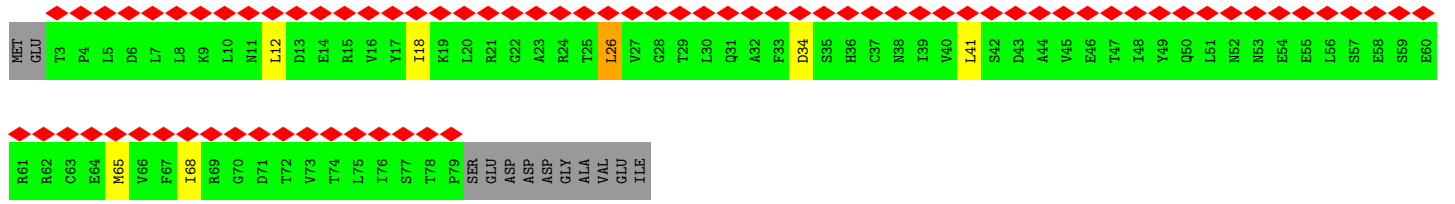
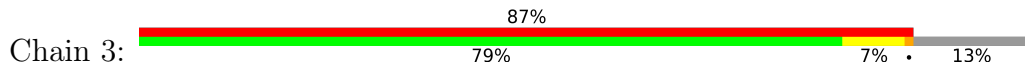
• Molecule 20: 13 kDa ribonucleoprotein-associated protein



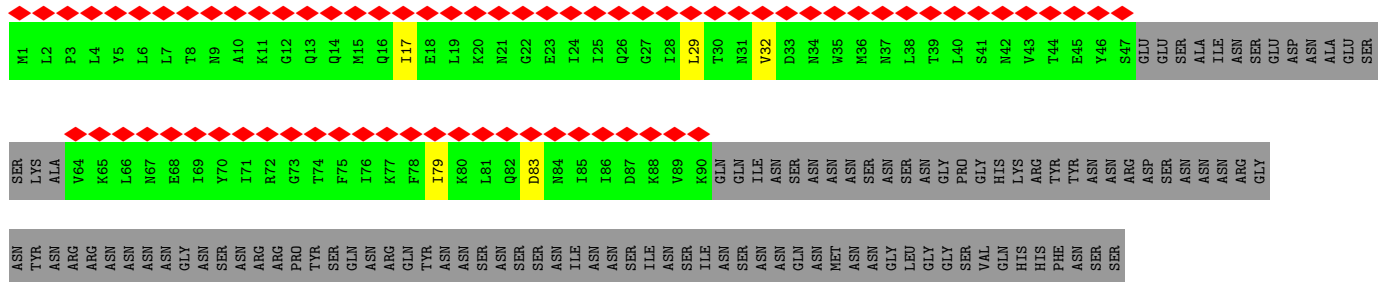
• Molecule 21: U6 snRNA-associated Sm-like protein LSm2



• Molecule 22: U6 snRNA-associated Sm-like protein LSm3

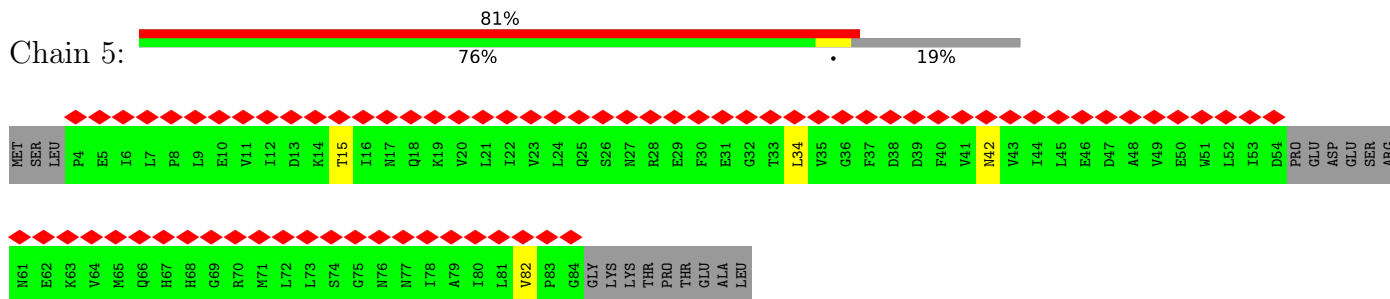


• Molecule 23: U6 snRNA-associated Sm-like protein LSm4

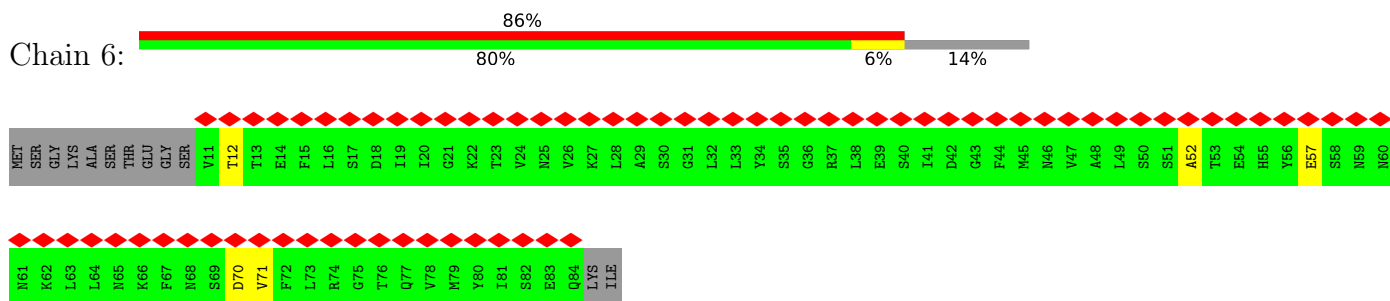


SER
PRO
GLN
LYS
VAL
GLU
PHE

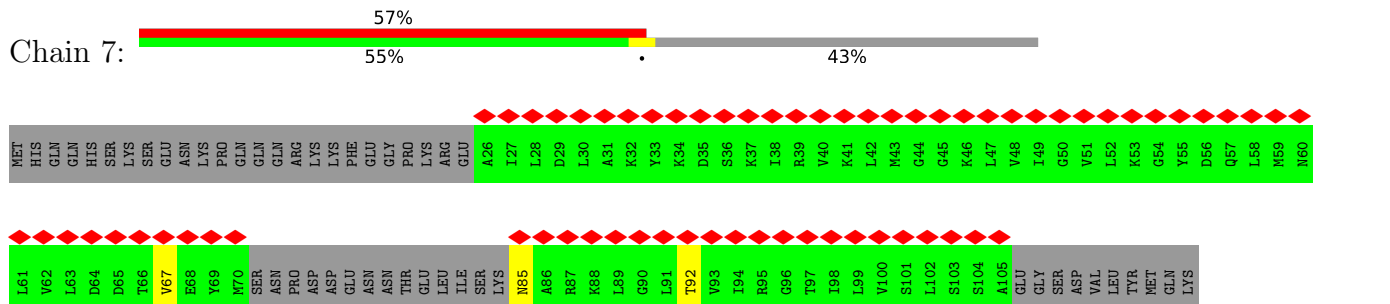
- Molecule 24: U6 snRNA-associated Sm-like protein LSm5



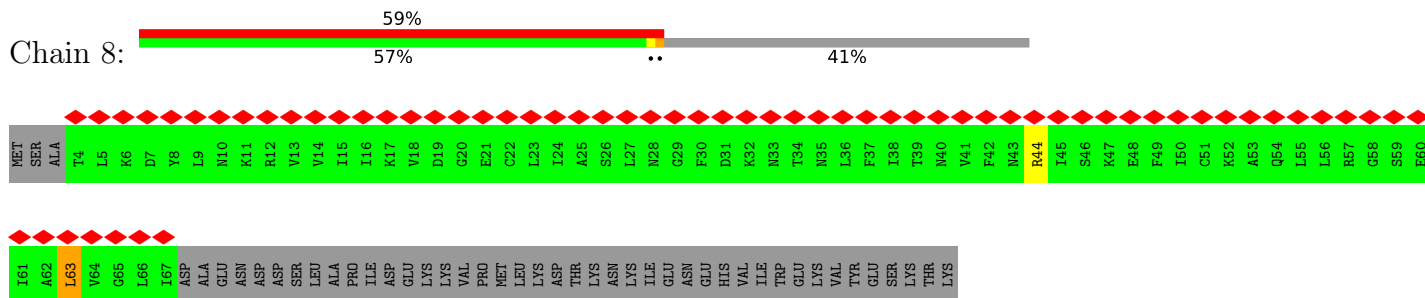
- Molecule 25: U6 snRNA-associated Sm-like protein LSm6



- Molecule 26: U6 snRNA-associated Sm-like protein LSm7

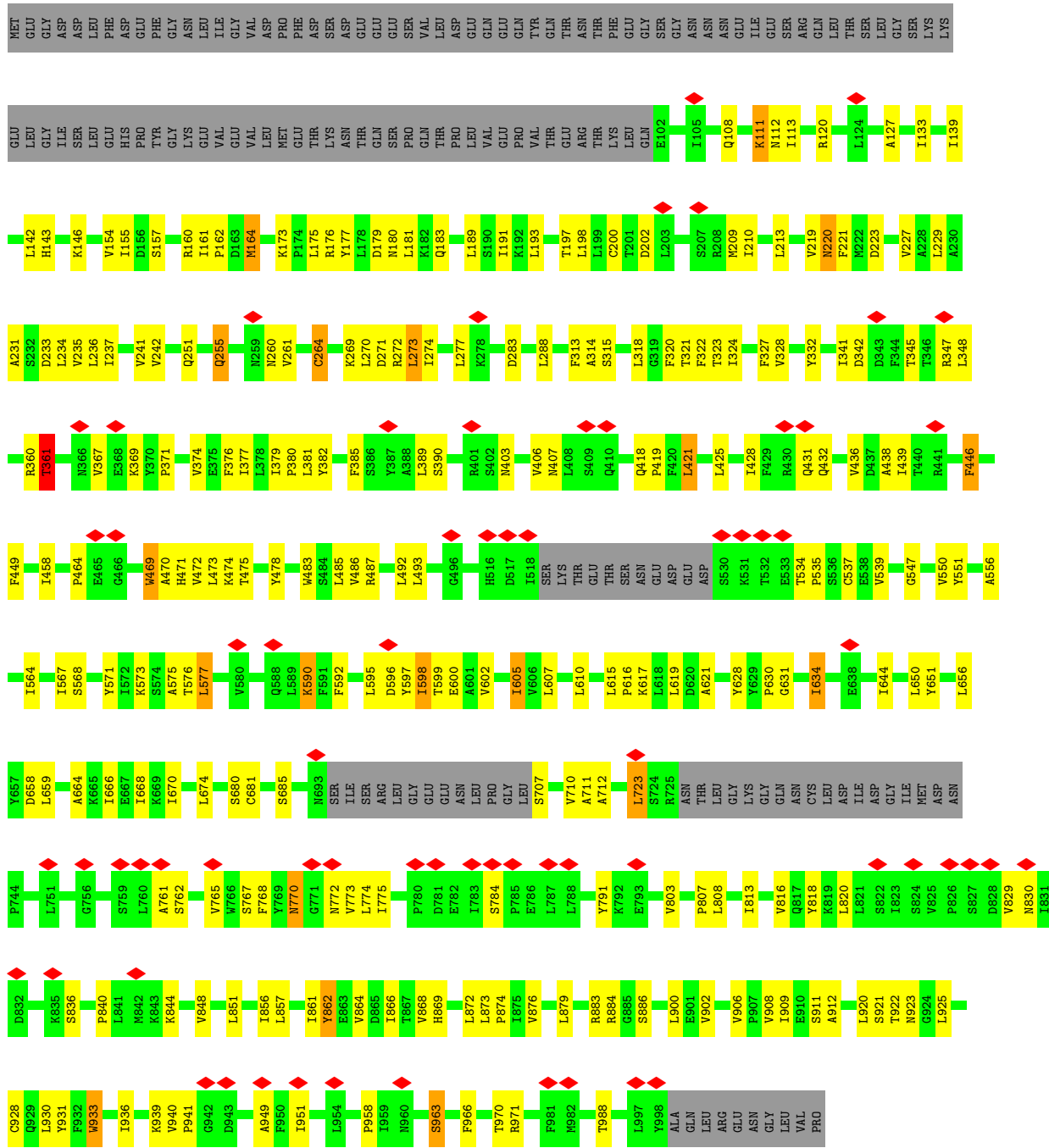


- Molecule 27: U6 snRNA-associated Sm-like protein LSm8



- Molecule 28: Pre-mRNA-splicing factor SNU114





4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	140155	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING ONLY	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	38	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	3500	Depositor
Magnification	35714	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.243	Depositor
Minimum map value	-0.122	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.007	Depositor
Recommended contour level	0.036	Depositor
Map size (\AA)	543.39996, 543.39996, 543.39996	wwPDB
Map dimensions	380, 380, 380	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.43, 1.43, 1.43	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: GTP

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	V	0.37	0/2943	0.78	4/4577 (0.1%)
2	W	0.33	0/1891	0.82	3/2933 (0.1%)
3	A	0.47	0/18226	0.77	4/24737 (0.0%)
4	H	0.43	0/2845	0.76	0/3843
5	J	0.47	0/5934	0.82	3/8039 (0.0%)
6	D	0.49	0/1172	0.85	1/1578 (0.1%)
7	F	0.48	0/3273	0.85	0/4413
8	G	0.46	0/2687	0.74	0/3611
9	B	0.42	0/14518	0.64	0/19682
11	b	0.37	0/636	0.61	0/856
11	k	0.40	0/636	0.62	0/856
12	h	0.38	0/649	0.56	0/880
12	l	0.43	0/725	0.62	0/980
13	j	0.41	0/753	0.64	0/1013
13	m	0.42	0/749	0.61	0/1009
14	d	0.38	0/634	0.61	0/859
14	n	0.41	0/634	0.55	0/859
15	e	0.42	0/585	0.58	0/795
15	p	0.44	0/585	0.57	0/795
16	f	0.42	0/585	0.60	0/791
16	q	0.44	0/585	0.59	0/791
17	g	0.37	0/532	0.56	0/715
17	r	0.41	0/529	0.54	0/711
18	E	0.44	0/184	0.65	0/238
19	U	0.33	0/3350	0.80	2/5209 (0.0%)
20	K	0.49	0/949	0.84	0/1292
21	2	0.46	0/745	0.72	0/1005
22	3	0.43	0/617	0.64	0/836
23	4	0.42	0/594	0.54	0/802
24	5	0.41	0/595	0.57	0/806
25	6	0.43	0/584	0.53	0/787
26	7	0.39	0/505	0.57	0/675

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
27	8	0.43	0/501	0.53	0/673
28	C	0.45	0/6590	0.78	1/8975 (0.0%)
All	All	0.44	0/77520	0.73	18/106621 (0.0%)

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
3	A	0	9
5	J	0	2
7	F	0	1
9	B	0	2
11	k	0	1
28	C	0	2
All	All	0	17

There are no bond length outliers.

The worst 5 of 18 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	V	17	A	C2'-C3'-O3'	7.97	127.03	109.50
5	J	613	LEU	CA-CB-CG	7.34	132.18	115.30
2	W	45	A	C2'-C3'-O3'	6.66	124.35	113.70
6	D	103	LEU	CA-CB-CG	6.55	130.37	115.30
19	U	128	A	C2'-C3'-O3'	5.94	123.21	113.70

There are no chirality outliers.

5 of 17 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	A	286	LEU	Peptide
3	A	467	GLU	Peptide
3	A	557	PHE	Peptide
3	A	974	ASN	Peptide
3	A	979	SER	Peptide

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	V	2635	0	1328	39	0
2	W	1697	0	858	79	0
3	A	17778	0	17575	405	0
4	H	2789	0	2725	58	0
5	J	5822	0	5792	124	0
6	D	1151	0	1138	27	0
7	F	3218	0	3297	72	0
8	G	2632	0	2599	42	0
9	B	14212	0	14210	106	0
10	x	500	0	110	0	0
11	b	631	0	670	0	0
11	k	631	0	670	0	0
12	h	644	0	686	0	0
12	l	720	0	772	0	0
13	j	741	0	778	0	0
13	m	737	0	767	0	0
14	d	625	0	647	0	0
14	n	625	0	647	0	0
15	e	575	0	597	0	0
15	p	575	0	597	0	0
16	f	573	0	572	0	0
16	q	573	0	572	0	0
17	g	529	0	557	0	0
17	r	526	0	555	0	0
18	E	1713	0	567	1	0
19	U	2999	0	1516	55	0
20	K	936	0	987	42	0
21	2	735	0	744	11	0
22	3	611	0	620	4	0
23	4	588	0	602	2	0
24	5	588	0	594	3	0
25	6	577	0	572	2	0
26	7	504	0	557	1	0
27	8	498	0	533	1	0
28	C	6450	0	6419	167	0
29	C	32	0	12	0	0
All	All	77370	0	72442	1076	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 8.

The worst 5 of 1076 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:462:LEU:CD2	28:C:403:ASN:HD22	1.12	1.53
3:A:459:ALA:C	28:C:376:PHE:HE1	1.22	1.43
2:W:26:A:C5	3:A:671:TYR:CD1	2.10	1.39
3:A:462:LEU:CD2	28:C:403:ASN:ND2	1.77	1.38
3:A:462:LEU:HD21	28:C:403:ASN:ND2	1.35	1.32

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	A	2182/2413 (90%)	1924 (88%)	217 (10%)	41 (2%)	8	42
4	H	355/465 (76%)	301 (85%)	43 (12%)	11 (3%)	4	32
5	J	719/899 (80%)	643 (89%)	59 (8%)	17 (2%)	6	37
6	D	138/143 (96%)	124 (90%)	9 (6%)	5 (4%)	3	29
7	F	413/494 (84%)	361 (87%)	35 (8%)	17 (4%)	3	26
8	G	316/469 (67%)	274 (87%)	34 (11%)	8 (2%)	5	36
9	B	1776/2163 (82%)	1623 (91%)	132 (7%)	21 (1%)	13	51
11	b	76/196 (39%)	67 (88%)	9 (12%)	0	100	100
11	k	76/196 (39%)	70 (92%)	5 (7%)	1 (1%)	12	50
12	h	78/146 (53%)	73 (94%)	4 (5%)	1 (1%)	12	50
12	l	87/146 (60%)	76 (87%)	9 (10%)	2 (2%)	6	38
13	j	92/110 (84%)	87 (95%)	5 (5%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
13	m	92/110 (84%)	87 (95%)	5 (5%)	0	100	100
14	d	80/101 (79%)	72 (90%)	7 (9%)	1 (1%)	12	50
14	n	80/101 (79%)	73 (91%)	7 (9%)	0	100	100
15	e	71/94 (76%)	65 (92%)	6 (8%)	0	100	100
15	p	71/94 (76%)	64 (90%)	7 (10%)	0	100	100
16	f	70/86 (81%)	64 (91%)	4 (6%)	2 (3%)	4	33
16	q	70/86 (81%)	63 (90%)	7 (10%)	0	100	100
17	g	65/77 (84%)	63 (97%)	2 (3%)	0	100	100
17	r	65/77 (84%)	58 (89%)	7 (11%)	0	100	100
18	E	21/328 (6%)	20 (95%)	1 (5%)	0	100	100
20	K	122/126 (97%)	113 (93%)	7 (6%)	2 (2%)	9	46
21	2	88/95 (93%)	76 (86%)	11 (12%)	1 (1%)	14	53
22	3	75/89 (84%)	71 (95%)	4 (5%)	0	100	100
23	4	70/187 (37%)	65 (93%)	5 (7%)	0	100	100
24	5	71/93 (76%)	66 (93%)	5 (7%)	0	100	100
25	6	72/86 (84%)	67 (93%)	4 (6%)	1 (1%)	11	48
26	7	62/115 (54%)	57 (92%)	5 (8%)	0	100	100
27	8	62/109 (57%)	59 (95%)	3 (5%)	0	100	100
28	C	847/1008 (84%)	734 (87%)	82 (10%)	31 (4%)	3	28
All	All	8462/10902 (78%)	7560 (89%)	740 (9%)	162 (2%)	11	42

5 of 162 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	A	247	PRO
3	A	470	LEU
3	A	471	PRO
3	A	597	PHE
3	A	796	ASN

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	
3	A	1918/2182 (88%)	1836 (96%)	82 (4%)	29	63
4	H	305/410 (74%)	290 (95%)	15 (5%)	25	59
5	J	627/813 (77%)	595 (95%)	32 (5%)	24	58
6	D	129/132 (98%)	117 (91%)	12 (9%)	9	38
7	F	346/445 (78%)	313 (90%)	33 (10%)	8	37
8	G	289/436 (66%)	277 (96%)	12 (4%)	30	63
9	B	1592/1955 (81%)	1522 (96%)	70 (4%)	28	63
11	b	70/176 (40%)	70 (100%)	0	100	100
11	k	70/176 (40%)	67 (96%)	3 (4%)	29	63
12	h	77/129 (60%)	75 (97%)	2 (3%)	46	74
12	l	85/129 (66%)	81 (95%)	4 (5%)	26	61
13	j	79/103 (77%)	75 (95%)	4 (5%)	24	58
13	m	78/103 (76%)	75 (96%)	3 (4%)	33	66
14	d	69/89 (78%)	67 (97%)	2 (3%)	42	72
14	n	69/89 (78%)	66 (96%)	3 (4%)	29	63
15	e	65/83 (78%)	59 (91%)	6 (9%)	9	39
15	p	65/83 (78%)	60 (92%)	5 (8%)	13	45
16	f	63/77 (82%)	62 (98%)	1 (2%)	62	83
16	q	63/77 (82%)	62 (98%)	1 (2%)	62	83
17	g	58/66 (88%)	57 (98%)	1 (2%)	60	82
17	r	57/66 (86%)	56 (98%)	1 (2%)	59	81
18	E	20/20 (100%)	18 (90%)	2 (10%)	7	35
20	K	102/104 (98%)	92 (90%)	10 (10%)	8	36
21	2	85/91 (93%)	78 (92%)	7 (8%)	11	42
22	3	71/81 (88%)	69 (97%)	2 (3%)	43	72
23	4	64/172 (37%)	63 (98%)	1 (2%)	62	83
24	5	66/84 (79%)	66 (100%)	0	100	100
25	6	66/75 (88%)	65 (98%)	1 (2%)	65	84
26	7	56/103 (54%)	54 (96%)	2 (4%)	35	67
27	8	56/99 (57%)	54 (96%)	2 (4%)	35	67

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
28	C	673/910 (74%)	616 (92%)	57 (8%)	10	41
All	All	7433/9558 (78%)	7057 (95%)	376 (5%)	27	58

5 of 376 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
9	B	1483	VAL
14	d	10	LEU
9	B	1561	PHE
12	l	97	LEU
20	K	46	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 75 such sidechains are listed below:

Mol	Chain	Res	Type
15	e	34	GLN
28	C	290	HIS
17	g	66	ASN
24	5	61	ASN
4	H	392	HIS

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	V	122/160 (76%)	60 (49%)	13 (10%)
19	U	137/214 (64%)	75 (54%)	21 (15%)
2	W	77/112 (68%)	35 (45%)	12 (15%)
All	All	336/486 (69%)	170 (50%)	46 (13%)

5 of 170 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	V	2	U
1	V	11	A
1	V	15	G
1	V	18	A
1	V	19	U

5 of 46 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
19	U	32	G
19	U	82	A
19	U	40	C
19	U	75	A
19	U	95	C

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

1 ligand is modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
29	GTP	C	1101	-	26,34,34	0.82	1 (3%)	32,54,54	1.67	5 (15%)

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
29	GTP	C	1101	-	-	4/18/38/38	0/3/3/3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
29	C	1101	GTP	C6-N1	-2.12	1.34	1.37

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
29	C	1101	GTP	PB-O3B-PG	-4.87	116.11	132.83
29	C	1101	GTP	PA-O3A-PB	-4.14	118.61	132.83
29	C	1101	GTP	C5-C6-N1	2.61	118.55	113.95
29	C	1101	GTP	O6-C6-C5	-2.46	119.57	124.37
29	C	1101	GTP	C8-N7-C5	2.27	107.32	102.99

There are no chirality outliers.

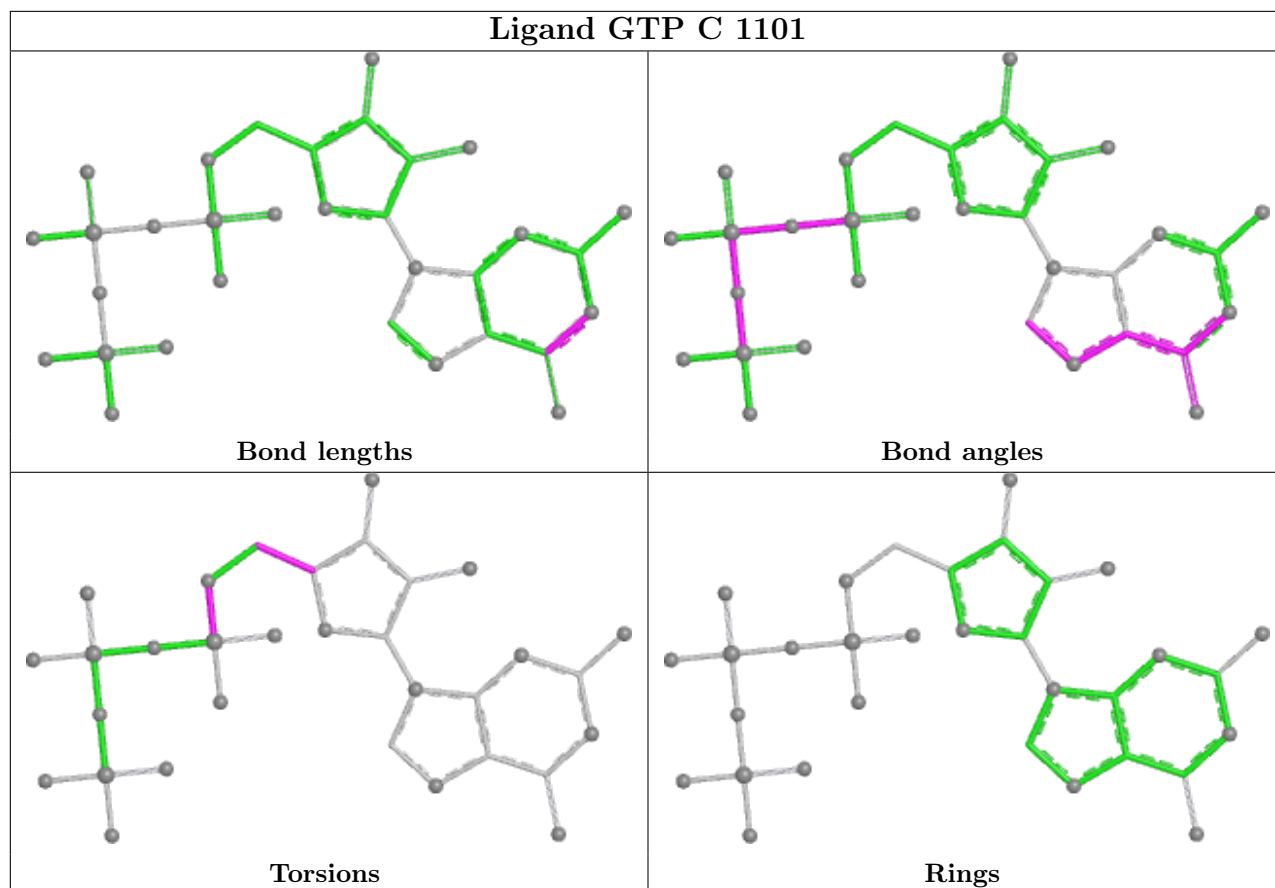
All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
29	C	1101	GTP	C5'-O5'-PA-O1A
29	C	1101	GTP	O4'-C4'-C5'-O5'
29	C	1101	GTP	C3'-C4'-C5'-O5'
29	C	1101	GTP	C5'-O5'-PA-O3A

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 [\(i\)](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
18	E	13
10	x	2
3	A	1
19	U	1

The worst 5 of 17 chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	x	120:UNK	C	201:UNK	N	117.38
1	x	62:UNK	C	101:UNK	N	54.41
1	E	132:UNK	C	150:UNK	N	36.51

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Continued from previous page...

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	E	170:UNK	C	180:UNK	N	34.13
1	E	102:UNK	C	120:UNK	N	31.43

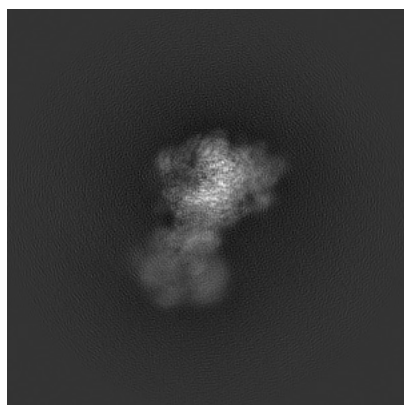
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-8012. These allow visual inspection of the internal detail of the map and identification of artifacts.

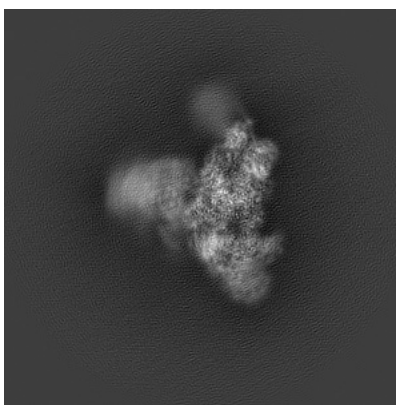
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

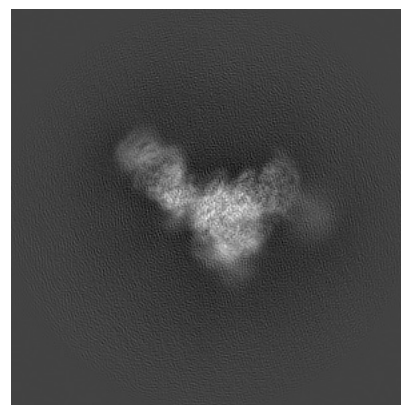
6.1.1 Primary map



X



Y

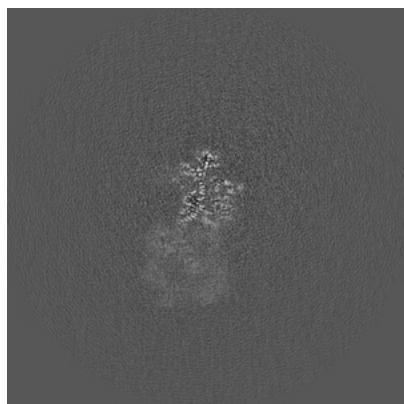


Z

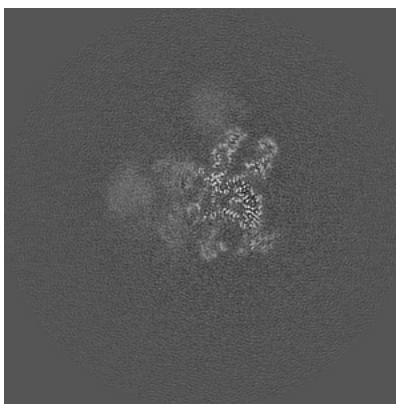
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

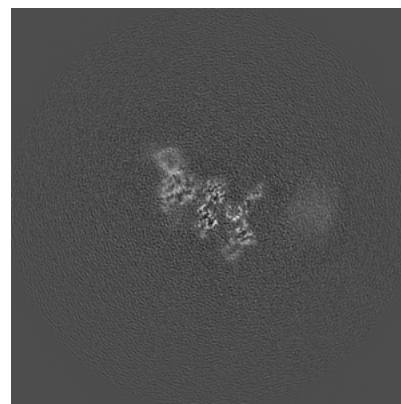
6.2.1 Primary map



X Index: 190



Y Index: 190

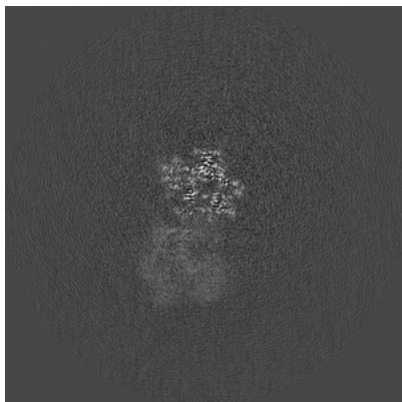


Z Index: 190

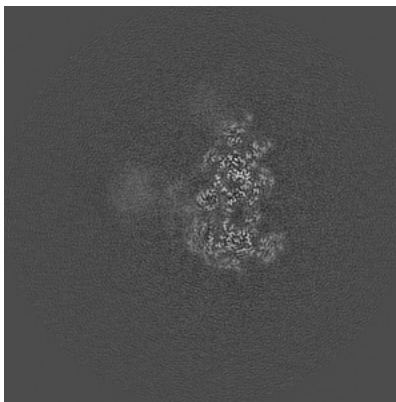
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

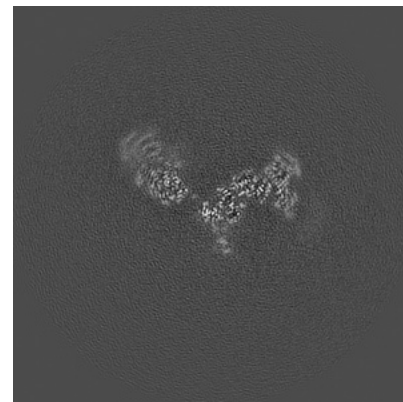
6.3.1 Primary map



X Index: 196



Y Index: 202



Z Index: 221

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

6.4 Orthogonal surface views [i](#)

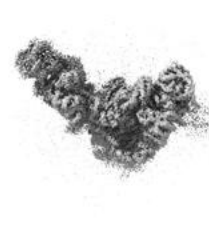
6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.036. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

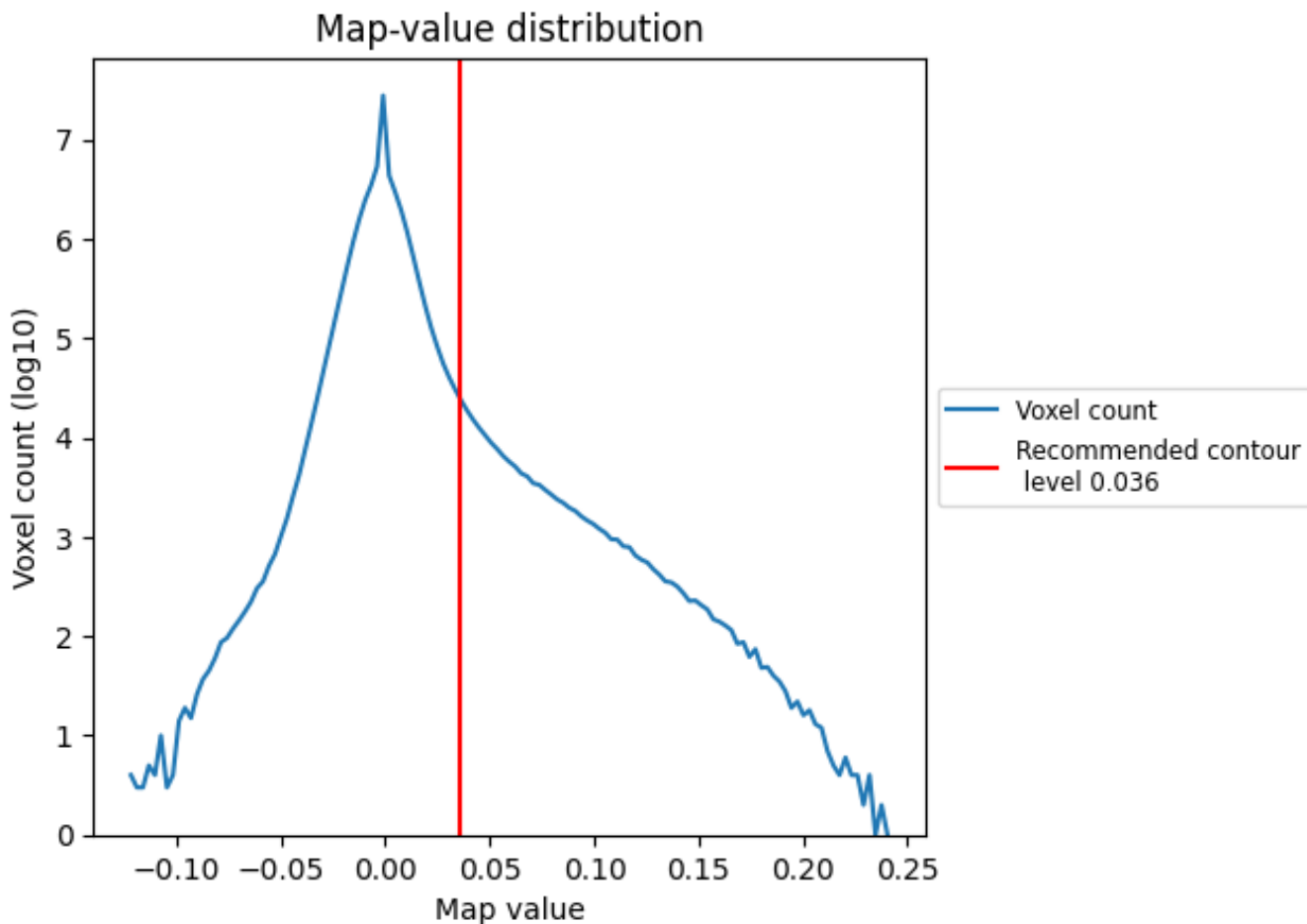
6.5 Mask visualisation

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

7 Map analysis [i](#)

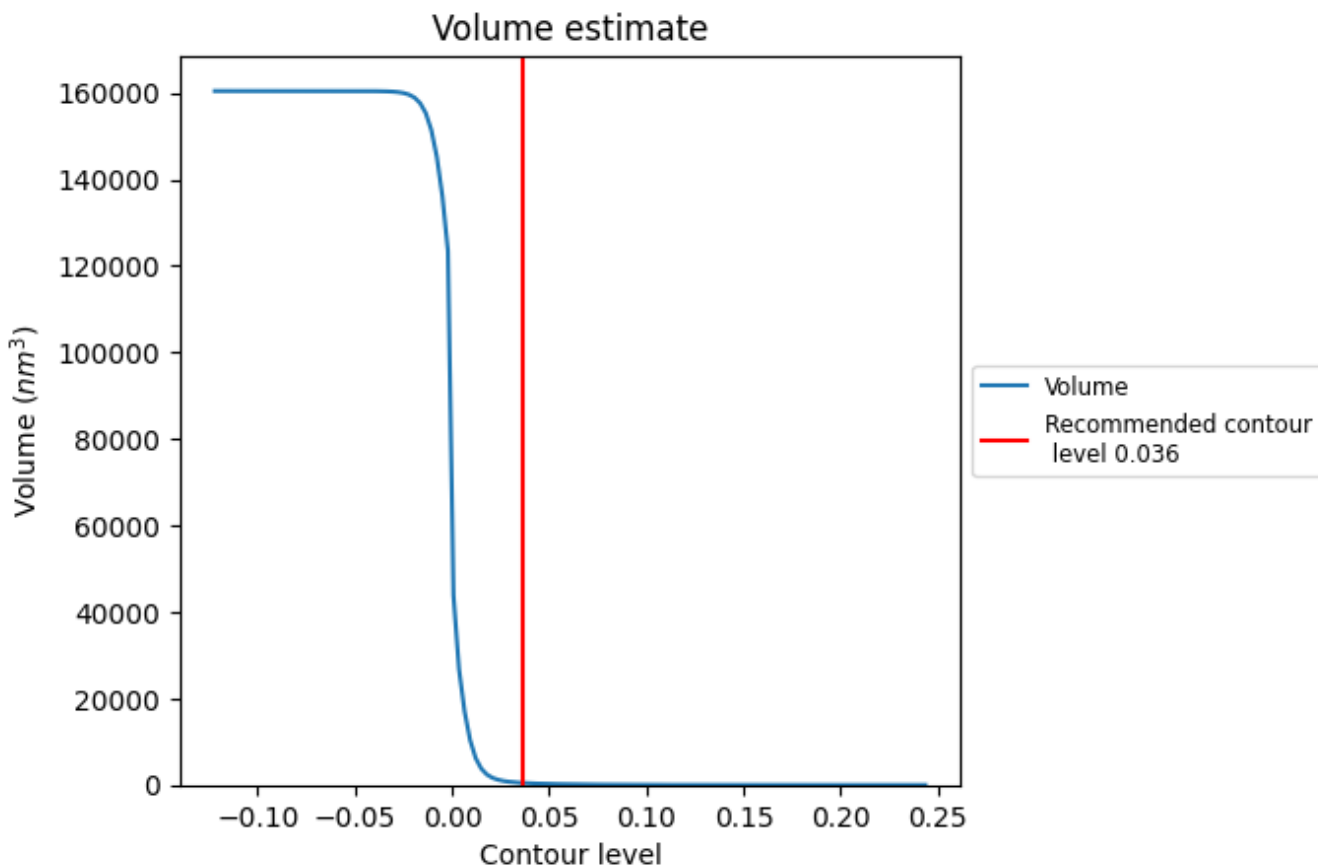
This section contains the results of statistical analysis of the map.

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.

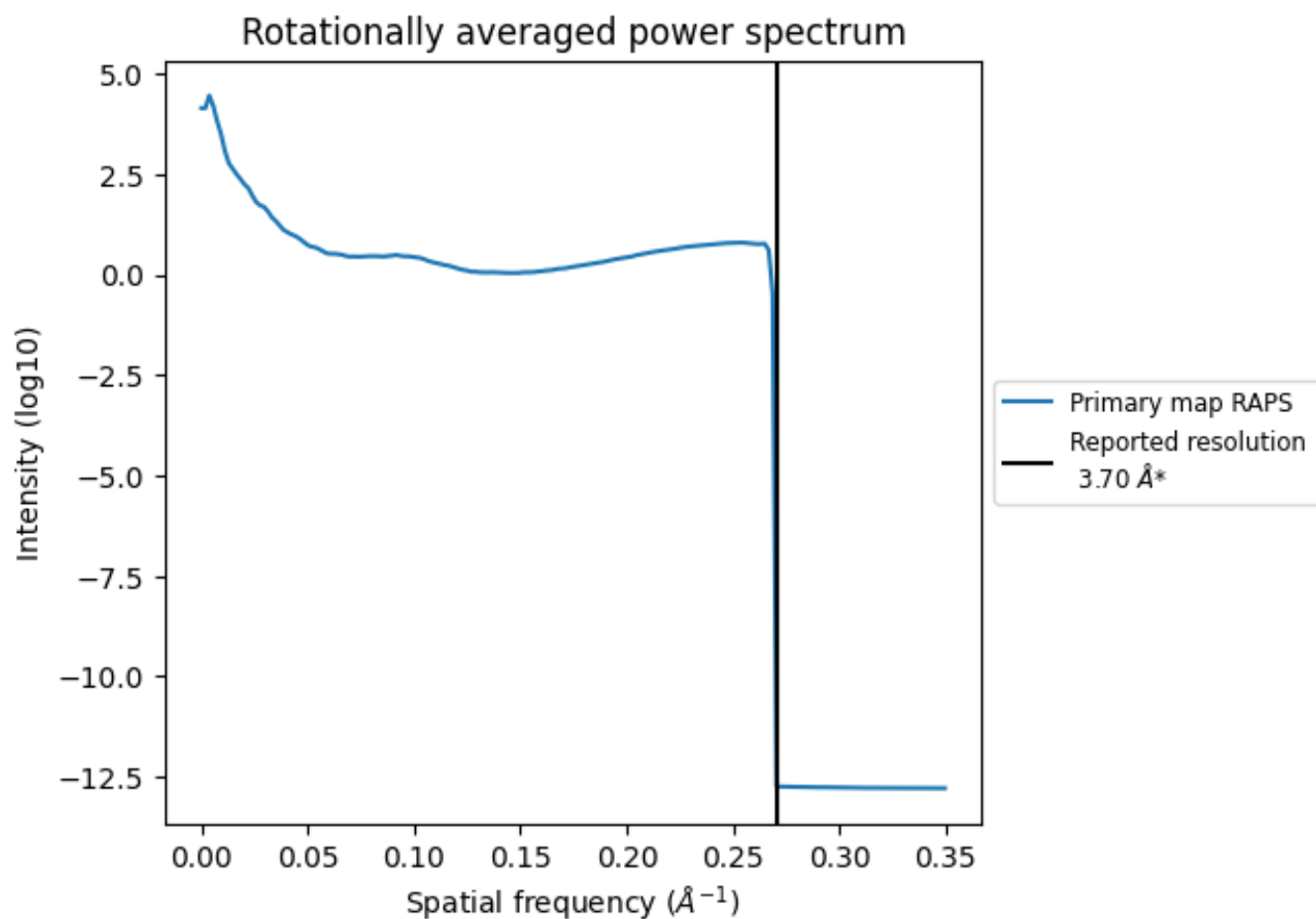
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 478 nm^3 ; this corresponds to an approximate mass of 432 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](#)

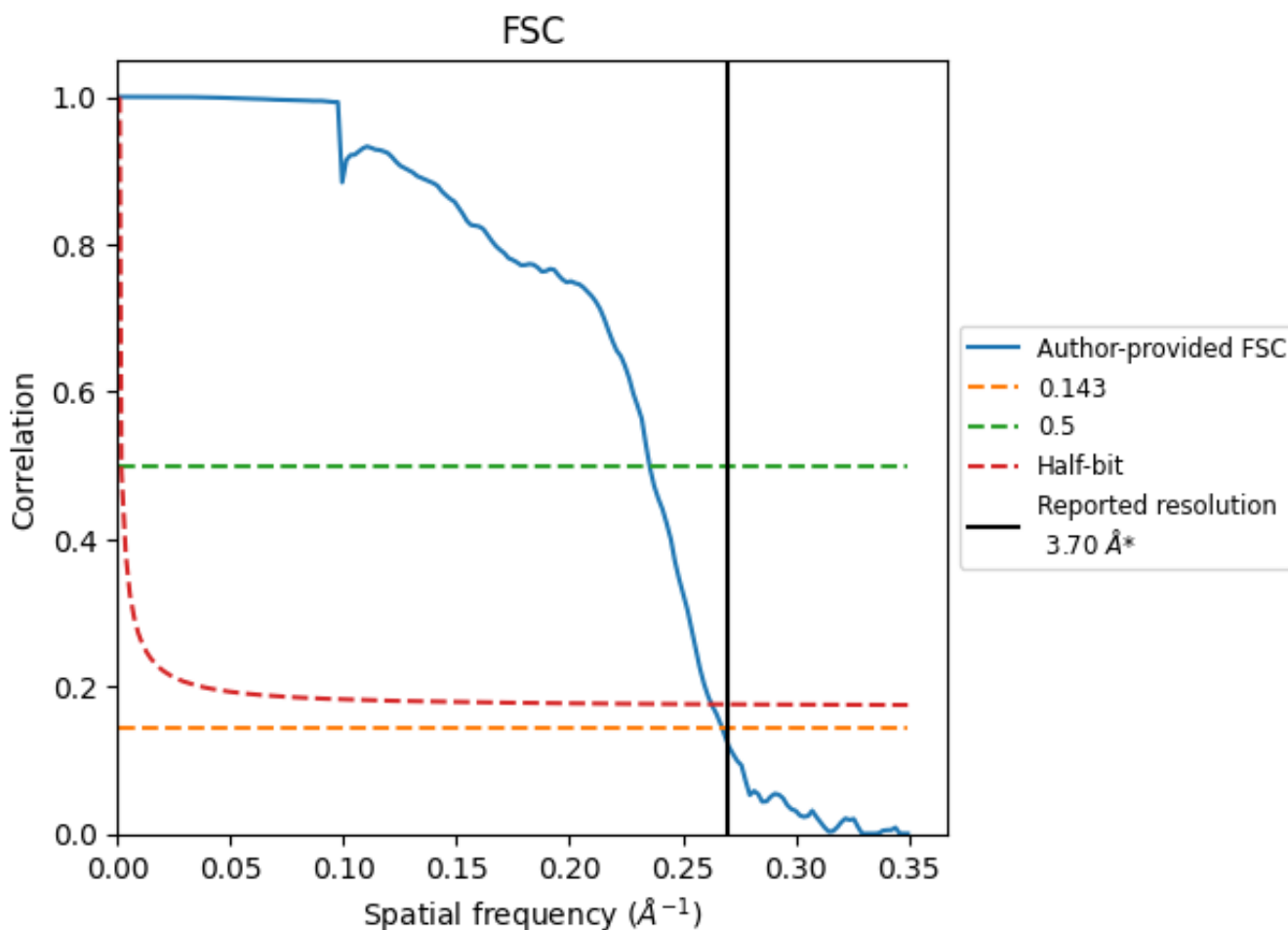


*Reported resolution corresponds to spatial frequency of 0.270 Å⁻¹

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 0.270 Å⁻¹

8.2 Resolution estimates [i](#)

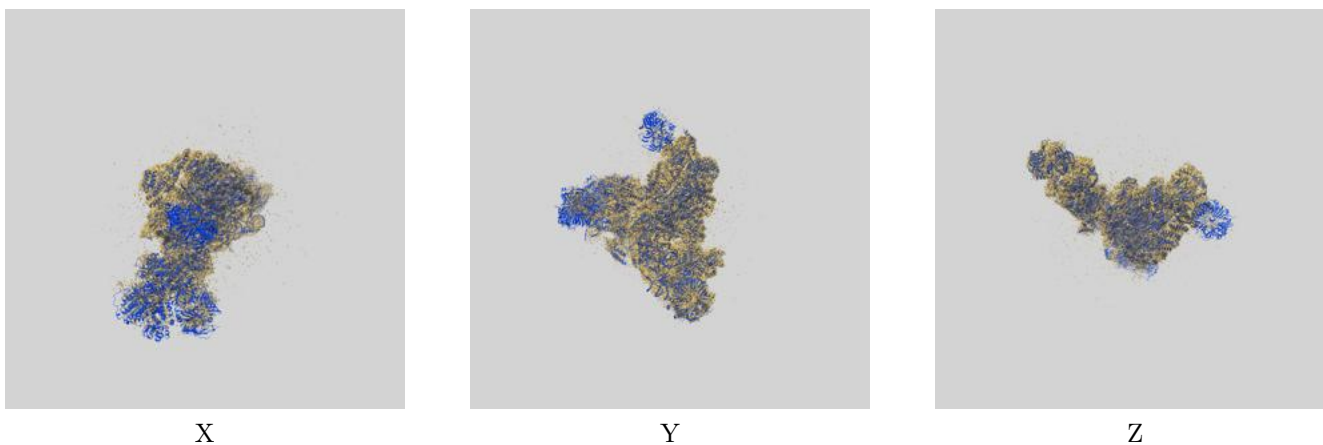
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.70	-	-
Author-provided FSC curve	3.74	4.25	3.81
Unmasked-calculated*	-	-	-

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

9 Map-model fit [i](#)

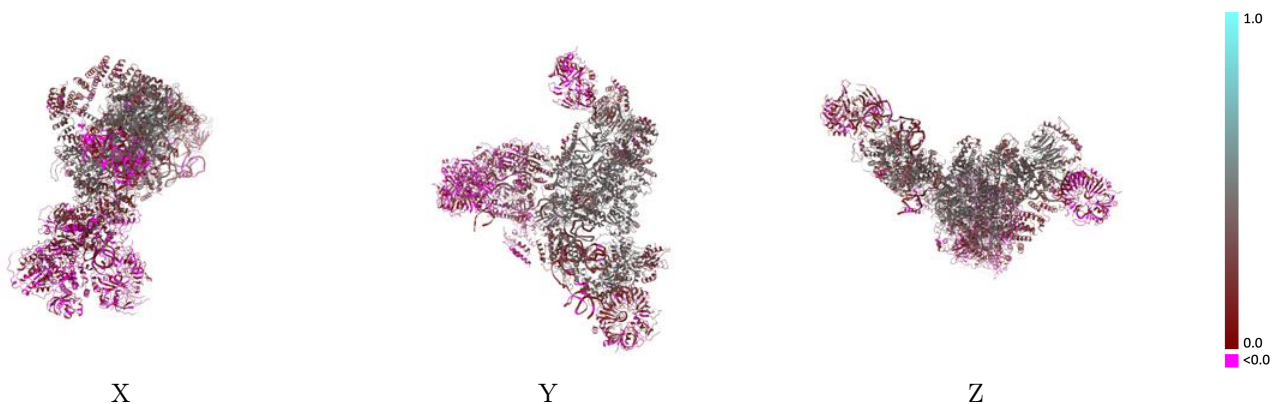
This section contains information regarding the fit between EMDB map EMD-8012 and PDB model 5GAN. Per-residue inclusion information can be found in section [3](#) on page [11](#).

9.1 Map-model overlay [i](#)



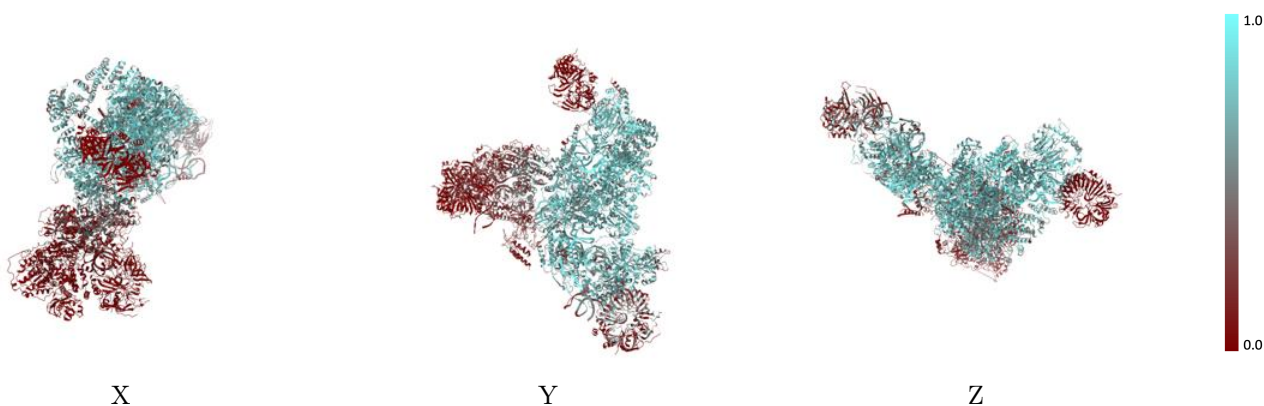
The images above show the 3D surface view of the map at the recommended contour level 0.036 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



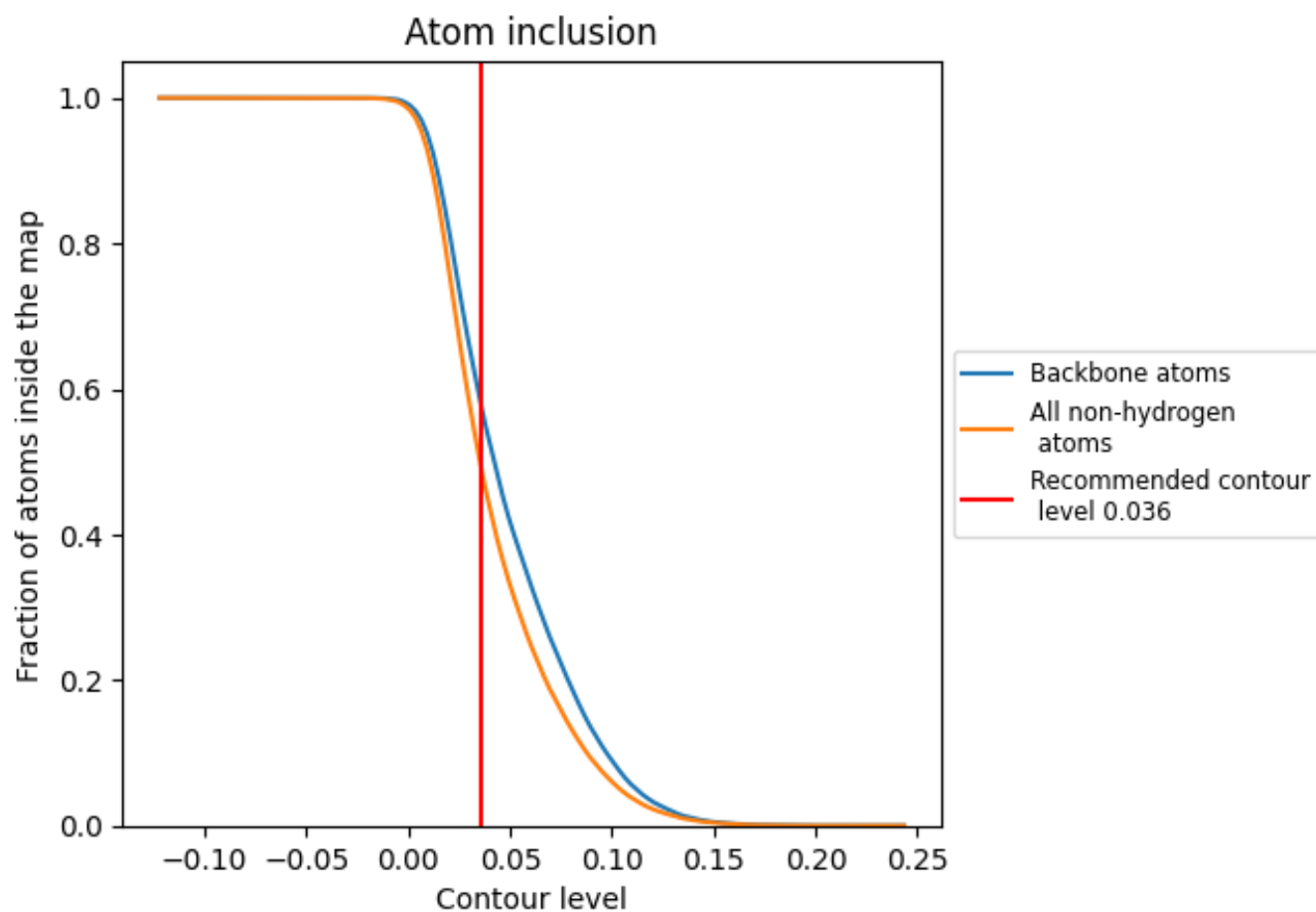
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.036).









































































9.4 Atom inclusion [i](#)



At the recommended contour level, 58% of all backbone atoms, 49% 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 (0.036) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.4890	 0.2540
2	 0.0222	 0.0760
3	 0.0084	 0.0640
4	 0.0189	 0.0770
5	 0.0000	 0.0550
6	 0.0035	 0.0430
7	 0.0101	 0.0630
8	 0.0102	 0.0400
A	 0.6815	 0.3630
B	 0.1815	 0.1170
C	 0.7241	 0.3730
D	 0.7458	 0.4020
E	 0.0848	 0.0850
F	 0.7667	 0.4080
G	 0.6913	 0.3490
H	 0.7421	 0.3860
J	 0.6790	 0.3010
K	 0.7998	 0.4520
U	 0.6445	 0.2000
V	 0.5712	 0.2740
W	 0.7071	 0.2760
b	 0.3306	 0.1900
d	 0.4320	 0.2390
e	 0.2378	 0.1230
f	 0.2313	 0.0880
g	 0.3301	 0.1810
h	 0.2893	 0.1520
j	 0.2058	 0.1110
k	 0.0308	 0.0540
l	 0.0339	 0.0340
m	 0.0375	 0.0270
n	 0.0097	 0.0140
p	 0.0070	 0.0770
q	 0.0178	 0.0120
r	 0.0077	 0.0270
x	 0.7280	 0.3730

