



wwPDB EM Validation Summary Report ⓘ

Mar 6, 2025 – 01:57 pm GMT

PDB ID : 8S1U
EMDB ID : EMD-19641
Title : YlmH bound to stalled 50S subunits with RqcH and PtRNA
Authors : Paternoga, H.; Wilson, D.N.
Deposited on : 2024-02-16
Resolution : 3.40 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 : **FAILED**
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.41

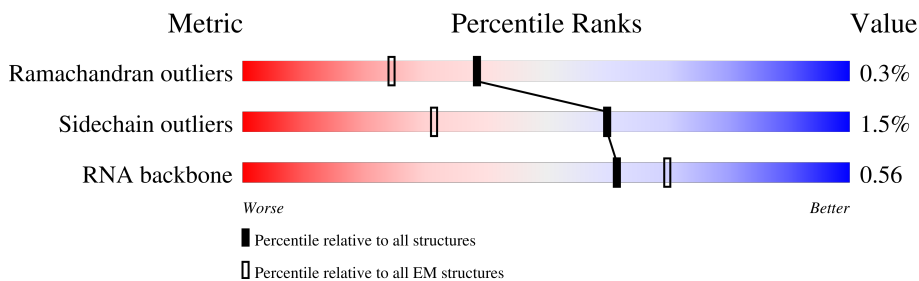
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.40 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.



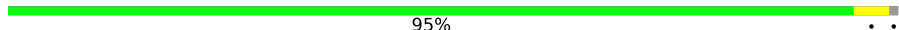
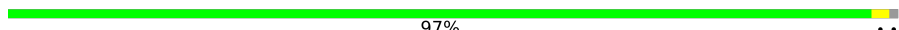
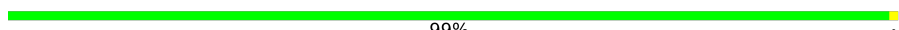
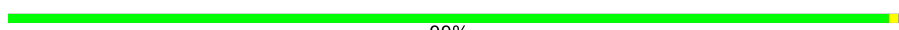
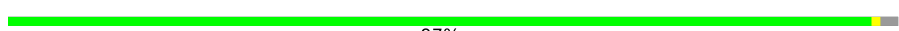







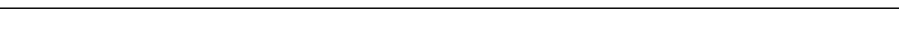
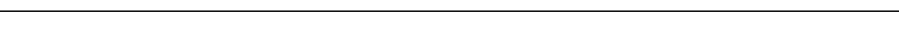
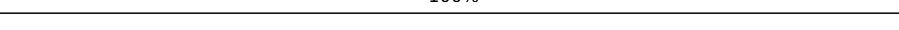
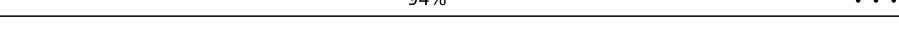
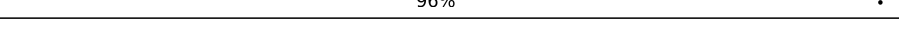
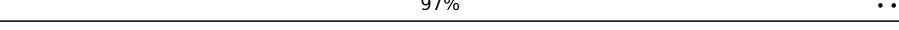


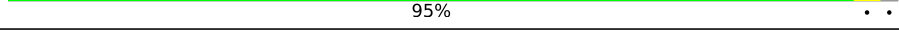
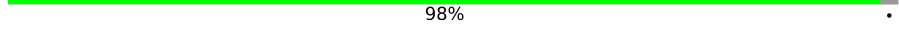
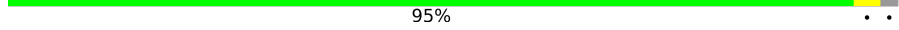

Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415
RNA backbone	6643	2191

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	a	76	50% 39% 9%
1	c	76	54% 33% 13%
2	0	59	88% 10%
3	1	49	96%
4	2	44	100%
5	3	66	95%
6	4	37	100%
7	6	66	68% 30%
8	B	112	76% 22%

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Mol	Chain	Length	Quality of chain
9	C	277	95% 
10	D	209	97% 
11	E	207	99% 
12	F	179	99% 
13	G	179	97% 
14	J	145	98% 
15	K	122	98% 
16	L	146	99% 
17	M	144	92%  6%
18	N	120	97% 
19	O	120	100% 
20	P	115	95% 
21	Q	119	97% 
22	R	102	100% 
23	S	113	94%  ..
24	T	95	96%  .
25	U	103	97% 
26	V	275	89%  . 9%
27	W	94	84%  . 15%
28	X	62	95% 
29	Y	66	98%  .
30	Z	59	95% 
31	H	570	91%  9%
32	A	2928	80%  15% 5%

2 Entry composition [i](#)

There are 33 unique types of molecules in this entry. The entry contains 93269 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 P-tRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
1	c	66	1413	628	254	465	66	0	0
1	a	69	1477	657	268	483	69	0	0

- Molecule 2 is a protein called 50S ribosomal protein L32.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	0	53	418	258	84	69	7	0	0

- Molecule 3 is a protein called 50S ribosomal protein L33 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	1	49	411	250	82	75	4	0	0

- Molecule 4 is a protein called 50S ribosomal protein L34.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	2	44	368	222	89	55	2	0	0

- Molecule 5 is a protein called 50S ribosomal protein L35.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	3	64	512	321	107	82	2	0	0

- Molecule 6 is a protein called 50S ribosomal protein L36.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	4	37	Total	C	N	O	S	0	0
			297	186	60	46	5		

- Molecule 7 is a protein called 50S ribosomal protein L31.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	6	46	Total	C	N	O	S	0	0
			356	222	63	66	5		

- Molecule 8 is a RNA chain called 5S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	B	112	Total	C	N	O	P	0	0
			2392	1068	435	778	111		

- Molecule 9 is a protein called 50S ribosomal protein L2.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	C	273	Total	C	N	O	S	0	0
			2094	1302	412	374	6		

- Molecule 10 is a protein called 50S ribosomal protein L3.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	D	207	Total	C	N	O	S	0	0
			1575	988	290	292	5		

- Molecule 11 is a protein called 50S ribosomal protein L4.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	E	206	Total	C	N	O	S	0	0
			1567	983	290	292	2		

- Molecule 12 is a protein called 50S ribosomal protein L5.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	F	178	Total	C	N	O	S	0	0
			1405	893	245	260	7		

- Molecule 13 is a protein called Large ribosomal subunit protein uL6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
13	G	175	1342	835	248	257	2	0	0

- Molecule 14 is a protein called 50S ribosomal protein L13.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
14	J	143	1131	714	207	205	5	0	0

- Molecule 15 is a protein called 50S ribosomal protein L14.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
15	K	122	921	571	173	173	4	0	0

- Molecule 16 is a protein called 50S ribosomal protein L15.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
16	L	146	1082	671	207	202	2	0	0

- Molecule 17 is a protein called 50S ribosomal protein L16.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
17	M	135	1076	690	205	176	5	0	0

- Molecule 18 is a protein called 50S ribosomal protein L17.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
18	N	119	954	583	186	181	4	0	0

- Molecule 19 is a protein called 50S ribosomal protein L18.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
19	O	120	913	564	176	172	1	0	0

- Molecule 20 is a protein called 50S ribosomal protein L19.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
20	P	113	922	588	177	156	1	0	0

- Molecule 21 is a protein called Large ribosomal subunit protein bL20.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
21	Q	118	950	597	191	158	4	0	0

- Molecule 22 is a protein called 50S ribosomal protein L21.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
22	R	102	795	506	140	148	1	0	0

- Molecule 23 is a protein called 50S ribosomal protein L22.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
23	S	110	850	530	165	151	4	0	0

- Molecule 24 is a protein called Large ribosomal subunit protein uL23.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
24	T	91	733	458	135	137	3	0	0

- Molecule 25 is a protein called 50S ribosomal protein L24.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
25	U	102	770	482	143	141	4	0	0

- Molecule 26 is a protein called Putative RNA-binding protein YlmH.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
26	V	249	1988	1256	350	376	6	0	0

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
V	258	GLY	-	expression tag	UNP P71020
V	259	SER	-	expression tag	UNP P71020
V	260	GLY	-	expression tag	UNP P71020
V	261	SER	-	expression tag	UNP P71020
V	262	GLY	-	expression tag	UNP P71020
V	263	SER	-	expression tag	UNP P71020
V	264	GLY	-	expression tag	UNP P71020
V	265	SER	-	expression tag	UNP P71020
V	266	GLY	-	expression tag	UNP P71020
V	267	SER	-	expression tag	UNP P71020
V	268	ASP	-	expression tag	UNP P71020
V	269	TYR	-	expression tag	UNP P71020
V	270	LYS	-	expression tag	UNP P71020
V	271	ASP	-	expression tag	UNP P71020
V	272	ASP	-	expression tag	UNP P71020
V	273	ASP	-	expression tag	UNP P71020
V	274	ASP	-	expression tag	UNP P71020
V	275	LYS	-	expression tag	UNP P71020

- Molecule 27 is a protein called Large ribosomal subunit protein bL27.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
27	W	80	611	378	119	114	0	0

- Molecule 28 is a protein called 50S ribosomal protein L28.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
28	X	61	468	289	98	79	2	0	0

- Molecule 29 is a protein called 50S ribosomal protein L29.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
29	Y	65	530	328	102	98	2	0	0

- Molecule 30 is a protein called Large ribosomal subunit protein uL30.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
30	Z	58	456	281	89	85	1	0	0

- Molecule 31 is a protein called Rqc2 homolog RqcH.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
31	H	518	2567	1530	518	519	0	0

- Molecule 32 is a RNA chain called 23S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
32	A	2789	59910	26733	11076	19313	2788	0	0

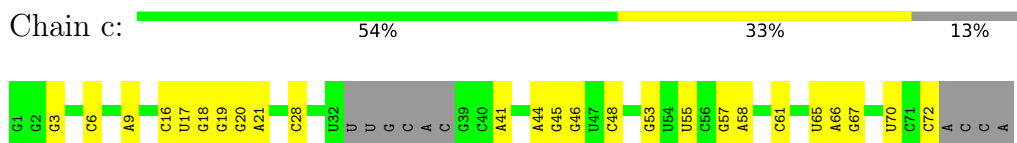
- Molecule 33 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms		AltConf
33	A	15	Total	K	0
			15	15	

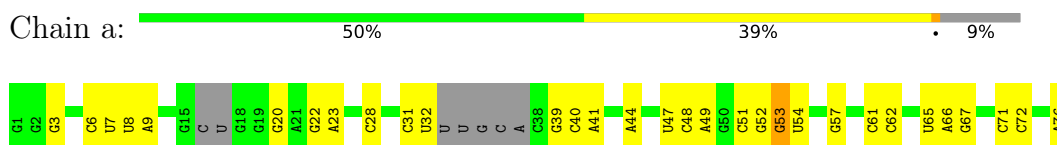
3 Residue-property plots [i](#)

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. 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. 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.

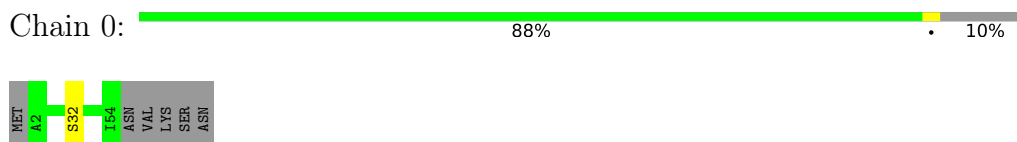
- Molecule 1: P-tRNA



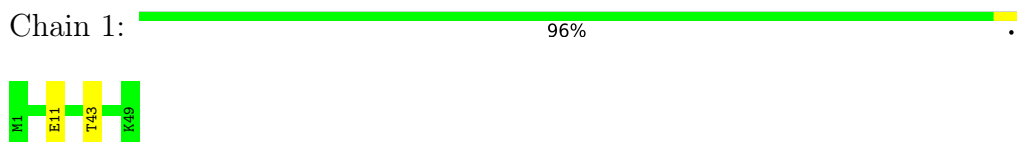
- Molecule 1: P-tRNA



- Molecule 2: 50S ribosomal protein L32



- Molecule 3: 50S ribosomal protein L33 1

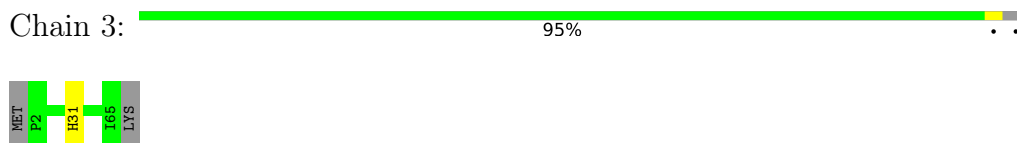


- Molecule 4: 50S ribosomal protein L34




There are no outlier residues recorded for this chain.

- Molecule 5: 50S ribosomal protein L35



- Molecule 6: 50S ribosomal protein L36

Chain 4:  100%



There are no outlier residues recorded for this chain.

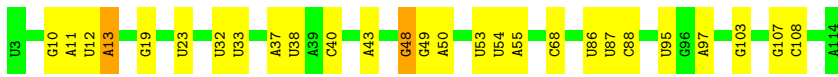
- Molecule 7: 50S ribosomal protein L31

Chain 6:  68%  30%



- Molecule 8: 5S rRNA

Chain B:  76%  22%



- Molecule 9: 50S ribosomal protein L2

Chain C:  95%



- Molecule 10: 50S ribosomal protein L3

Chain D:  97%



- Molecule 11: 50S ribosomal protein L4

Chain E:  99%



- Molecule 12: 50S ribosomal protein L5

Chain F:  99%



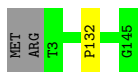
- Molecule 13: Large ribosomal subunit protein uL6

Chain G:  97% ..



- Molecule 14: 50S ribosomal protein L13

Chain J:  98% ..



- Molecule 15: 50S ribosomal protein L14

Chain K:  98% .



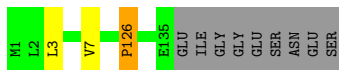
- Molecule 16: 50S ribosomal protein L15

Chain L:  99% .



- Molecule 17: 50S ribosomal protein L16

Chain M:  92% .. 6%



- Molecule 18: 50S ribosomal protein L17

Chain N:  97% ..



- Molecule 19: 50S ribosomal protein L18

Chain O:  100%

There are no outlier residues recorded for this chain.

- Molecule 20: 50S ribosomal protein L19

Chain P:  95% ..



- Molecule 21: Large ribosomal subunit protein bL20

Chain Q: 97%



- Molecule 22: 50S ribosomal protein L21

Chain R: 100%

There are no outlier residues recorded for this chain.

- Molecule 23: 50S ribosomal protein L22

Chain S: 94%



- Molecule 24: Large ribosomal subunit protein uL23

Chain T: 96%



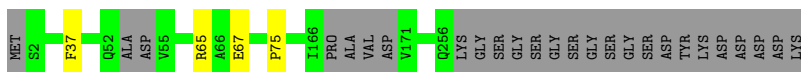
- Molecule 25: 50S ribosomal protein L24

Chain U: 97%



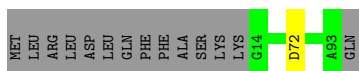
- Molecule 26: Putative RNA-binding protein YlmH

Chain V: 89%

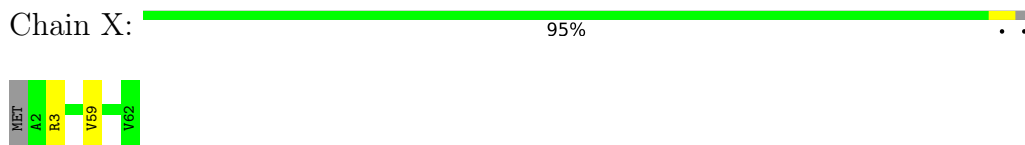


- Molecule 27: Large ribosomal subunit protein bL27

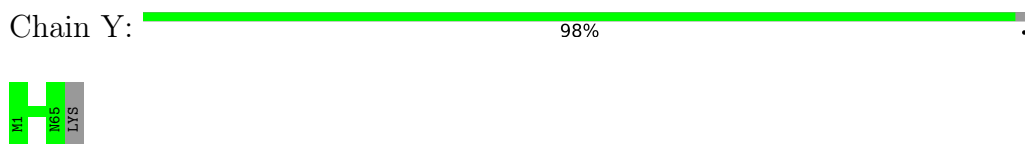
Chain W: 84%



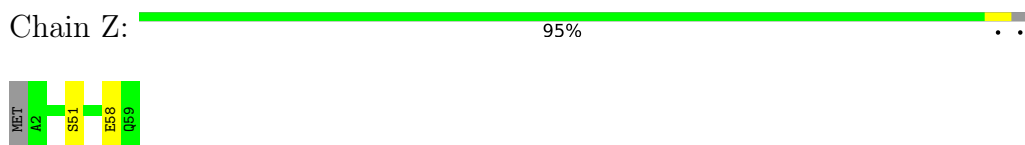
• Molecule 28: 50S ribosomal protein L28



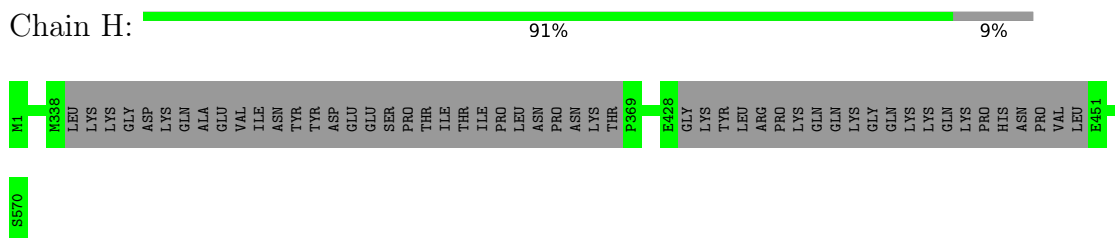
• Molecule 29: 50S ribosomal protein L29



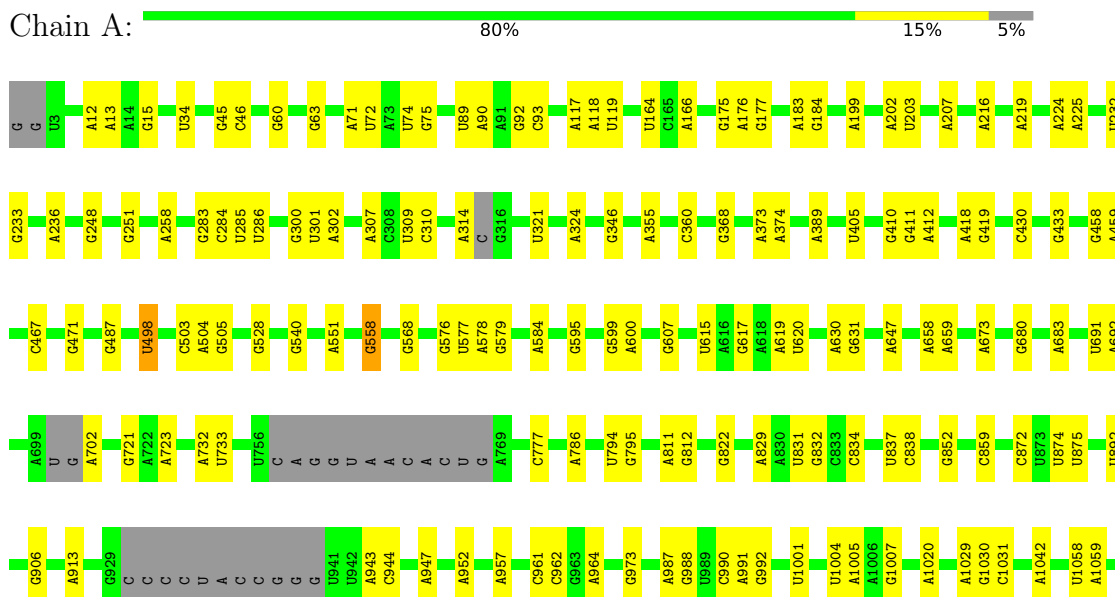
• Molecule 30: Large ribosomal subunit protein uL30



• Molecule 31: Rqc2 homolog RqcH



• Molecule 32: 23S rRNA



A2794	C2503	G2311	C2084	A1877	U1695	A1473	G1182	G1068
A2807	C2504	C2312	G2085	U1899	U1602	C1474	A1188	A1072
C2823	A2505	U2316	A2089	A1900	C1607	U1489	C1216	U1079
G2824	G2531	C2334	G2098	A1901	A1614	A1490	U	U1091
U2833	A2532	U2338	G2099	C1911	U1617	A1500	C	A1092
A2844	U2533	G2339	G2122	C1934	U1626	U1506	G1220	G1093
A2860	G2534	A2340	A2123	G1935	A1631	A1506	A1260	A1096
C2886	U2547	U2341	A2124	G1936	G1632	U1507	A1293	G1102
G2892	C2342	G2342	G1939	U	U1637	C1508	G1296	A1105
G2897	G2347	A	A	A	G1637	C1514	G1105	U1104
A2908	C2348	A	C	A	C1652	G1525	G1311	U1106
G2918	A2349	U	U	C	A1653	C1527	A1312	U1107
C2925	U2576	G	C	U	A1654	U1528	G1315	G1108
A	G2577	U	C	A	G1691	G1529	G1315	C1110
U	U2582	G	C	A	U1692	U1530	A1339	U1111
	U2583	G	U	A	C1693	G1531	A1340	U1112
	A2595	G	G	U	G1693	U1535	U1341	G1113
	G2596	U	U	C	G1719	A1536	G1342	G1114
	C2602	A	A	A	G1757	U1536	A1360	A1115
	G2603	C	C	A	U1751	A1540	A1360	A1116
	G2607	U	A	A	G1752	A1540	A1363	A1119
	A2616	A	G	A	U1752	U1543	C1364	A1123
	A2631	C	A	U	G1757	C1544	G1367	C1124
	G2632	C	A	U	U1759	A1553	G1377	U1127
	U2638	C	A	C	A1553	U	U1128	U1128
	U2642	U	G	U	A1555	A1556	A1388	U1129
	A2643	G	G	G	A1557	G1557	C1389	A1130
	G2692	G	U	C	G1558	C1558	C1390	A1131
	C2710	C	A	U	U1559	U1560	U1391	G1135
	U2718	C	A	A	G1792	G1563	A1398	G1135
	A2719	G	C	A	G1793	C1564	A1398	G1139
	C2720	U	C	G	A1802	U1565	A1404	U1140
	G2743	G	U	A	U1807	G1566	A1417	A1141
	U2755	A	U	A	G1810	C1577	U1418	A1142
	A2762	C	A	A	C1811	G	A1423	U1143
	C2763	G	A	A	A1820	A	A1423	A1144
	G2764	G	C	A	G1829	A	U1435	A1157
	G2773	C	C	A	G1830	A	U1435	G1158
	A2777	C	C	A	A1831	U	C1450	U1159
		C	C	A	A1845	U	C1450	G1160
		C	C	A	A1845	U	U1457	A1174
		C	C	A	A1858	C	U1458	G1177
		C	C	A	U1867	U	U1459	U1178
		C	C	A	A2079	A	G1460	U1178
		C	C	A	A2080	A	A1465	C1180
		C	C	A	A2080	A	A1465	C1181

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	3770	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	40	Depositor
Minimum defocus (nm)	400	Depositor
Maximum defocus (nm)	900	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	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: G7M, PSU, H2U, K, 2MA, 2MG, OMG, 5MU

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	0.62	0/1648	1.10	3/2564 (0.1%)
1	c	0.62	0/1577	1.03	1/2456 (0.0%)
2	0	0.43	0/425	0.75	0/563
3	1	0.42	0/416	0.83	0/551
4	2	0.51	0/371	0.84	0/483
5	3	0.44	0/519	0.76	0/680
6	4	0.42	0/300	0.77	0/393
7	6	0.40	0/363	0.56	0/485
8	B	0.57	0/2675	1.04	4/4170 (0.1%)
9	C	0.42	0/2131	0.77	0/2859
10	D	0.42	0/1597	0.76	0/2140
11	E	0.36	0/1586	0.70	0/2139
12	F	0.38	0/1424	0.64	0/1910
13	G	0.39	0/1360	0.66	0/1832
14	J	0.45	0/1154	0.72	0/1552
15	K	0.41	0/928	0.76	0/1245
16	L	0.41	0/1094	0.70	0/1457
17	M	0.41	0/1099	0.78	1/1468 (0.1%)
18	N	0.38	0/961	0.73	0/1284
19	O	0.38	0/922	0.71	0/1236
20	P	0.38	0/935	0.73	0/1251
21	Q	0.41	0/962	0.77	1/1277 (0.1%)
22	R	0.39	0/806	0.71	0/1080
23	S	0.39	0/859	0.75	1/1156 (0.1%)
24	T	0.42	0/739	0.78	0/985
25	U	0.38	0/780	0.68	0/1043
26	V	0.39	0/2016	0.67	0/2709
27	W	0.45	0/619	0.77	0/824
28	X	0.39	0/472	0.71	0/627
29	Y	0.35	0/531	0.71	0/707
30	Z	0.38	0/458	0.77	0/613
31	H	0.34	0/2564	0.50	0/3569

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
32	A	0.61	0/66810	1.00	34/104210 (0.0%)
All	All	0.56	0/101101	0.94	45/151518 (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
9	C	0	1
20	P	0	1
23	S	0	1
All	All	0	3

There are no bond length outliers.

The worst 5 of 45 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
32	A	1177	G	O3'-P-O5'	-6.51	91.62	104.00
32	A	207	A	O3'-P-O5'	-6.28	92.08	104.00
1	a	51	C	C2'-C3'-O3'	6.24	123.69	113.70
32	A	795	G	C1'-O4'-C4'	-6.07	105.04	109.90
32	A	2080	A	O3'-P-O5'	-6.01	92.58	104.00

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
9	C	80	THR	Peptide
20	P	26	LEU	Peptide
23	S	11	ARG	Sidechain

5.2 Too-close contacts

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	
2	0	51/59 (86%)	44 (86%)	6 (12%)	1 (2%)	6	25
3	1	47/49 (96%)	42 (89%)	4 (8%)	1 (2%)	5	24
4	2	42/44 (96%)	40 (95%)	2 (5%)	0	100	100
5	3	62/66 (94%)	56 (90%)	6 (10%)	0	100	100
6	4	35/37 (95%)	33 (94%)	2 (6%)	0	100	100
7	6	44/66 (67%)	44 (100%)	0	0	100	100
9	C	271/277 (98%)	254 (94%)	16 (6%)	1 (0%)	30	60
10	D	205/209 (98%)	187 (91%)	17 (8%)	1 (0%)	25	54
11	E	204/207 (99%)	193 (95%)	11 (5%)	0	100	100
12	F	176/179 (98%)	172 (98%)	4 (2%)	0	100	100
13	G	173/179 (97%)	168 (97%)	5 (3%)	0	100	100
14	J	141/145 (97%)	139 (99%)	2 (1%)	0	100	100
15	K	120/122 (98%)	106 (88%)	13 (11%)	1 (1%)	16	44
16	L	144/146 (99%)	133 (92%)	10 (7%)	1 (1%)	19	47
17	M	133/144 (92%)	120 (90%)	13 (10%)	0	100	100
18	N	117/120 (98%)	108 (92%)	9 (8%)	0	100	100
19	O	118/120 (98%)	113 (96%)	5 (4%)	0	100	100
20	P	111/115 (96%)	104 (94%)	7 (6%)	0	100	100
21	Q	116/119 (98%)	108 (93%)	8 (7%)	0	100	100
22	R	100/102 (98%)	99 (99%)	1 (1%)	0	100	100
23	S	108/113 (96%)	105 (97%)	3 (3%)	0	100	100
24	T	89/95 (94%)	85 (96%)	4 (4%)	0	100	100
25	U	100/103 (97%)	91 (91%)	9 (9%)	0	100	100
26	V	243/275 (88%)	225 (93%)	14 (6%)	4 (2%)	8	29
27	W	78/94 (83%)	73 (94%)	5 (6%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
28	X	59/62 (95%)	54 (92%)	3 (5%)	2 (3%)	3	17
29	Y	63/66 (96%)	62 (98%)	1 (2%)	0	100	100
30	Z	56/59 (95%)	53 (95%)	3 (5%)	0	100	100
31	H	512/570 (90%)	502 (98%)	10 (2%)	0	100	100
All	All	3718/3942 (94%)	3513 (94%)	193 (5%)	12 (0%)	38	66

5 of 12 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
9	C	222	GLY
10	D	73	GLU
26	V	37	PHE
26	V	65	ARG
2	0	32	SER

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	
2	0	47/53 (89%)	47 (100%)	0	100	100
3	1	47/47 (100%)	46 (98%)	1 (2%)	48	69
4	2	39/39 (100%)	39 (100%)	0	100	100
5	3	54/56 (96%)	53 (98%)	1 (2%)	52	71
6	4	35/35 (100%)	35 (100%)	0	100	100
7	6	39/55 (71%)	38 (97%)	1 (3%)	41	64
9	C	221/225 (98%)	213 (96%)	8 (4%)	30	56
10	D	168/170 (99%)	165 (98%)	3 (2%)	54	73
11	E	169/170 (99%)	167 (99%)	2 (1%)	67	80
12	F	153/154 (99%)	152 (99%)	1 (1%)	81	88
13	G	148/151 (98%)	146 (99%)	2 (1%)	62	77
14	J	121/123 (98%)	120 (99%)	1 (1%)	79	87

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
15	K	101/101 (100%)	99 (98%)	2 (2%)	50	70
16	L	110/110 (100%)	110 (100%)	0	100	100
17	M	109/116 (94%)	106 (97%)	3 (3%)	38	62
18	N	99/100 (99%)	96 (97%)	3 (3%)	36	61
19	O	93/93 (100%)	93 (100%)	0	100	100
20	P	98/100 (98%)	95 (97%)	3 (3%)	35	60
21	Q	97/98 (99%)	95 (98%)	2 (2%)	48	69
22	R	84/84 (100%)	84 (100%)	0	100	100
23	S	91/93 (98%)	88 (97%)	3 (3%)	33	58
24	T	82/85 (96%)	82 (100%)	0	100	100
25	U	86/87 (99%)	84 (98%)	2 (2%)	45	67
26	V	215/234 (92%)	215 (100%)	0	100	100
27	W	61/74 (82%)	60 (98%)	1 (2%)	58	75
28	X	49/50 (98%)	49 (100%)	0	100	100
29	Y	56/57 (98%)	56 (100%)	0	100	100
30	Z	52/53 (98%)	50 (96%)	2 (4%)	28	54
All	All	2724/2813 (97%)	2683 (98%)	41 (2%)	60	76

5 of 41 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
20	P	24	ASP
23	S	102	HIS
20	P	80	LYS
21	Q	34	VAL
25	U	31	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 19 such sidechains are listed below:

Mol	Chain	Res	Type
26	V	7	HIS
28	X	17	ASN
28	X	23	ASN
26	V	204	ASN
15	K	3	GLN

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	a	66/76 (86%)	29 (43%)	0
1	c	64/76 (84%)	24 (37%)	0
32	A	2778/2928 (94%)	372 (13%)	53 (1%)
8	B	111/112 (99%)	24 (21%)	5 (4%)
All	All	3019/3192 (94%)	449 (14%)	58 (1%)

5 of 449 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	c	3	G
1	c	6	C
1	c	9	A
1	c	16	C
1	c	17	U

5 of 58 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
32	A	1339	A
32	A	2631	A
32	A	1536	A
32	A	2576	U
32	A	2348	C

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

12 non-standard protein/DNA/RNA residues are 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	$\# Z > 2$
32	PSU	A	1001	32	18,21,22	0.83	1 (5%)	22,30,33	0.72	0
32	5MU	A	794	32	19,22,23	0.28	0	28,32,35	0.33	0
32	OMG	A	2582	32	18,26,27	1.04	3 (16%)	19,38,41	0.69	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
32	5MU	A	620	33,32	19,22,23	0.36	0	28,32,35	0.66	2 (7%)
32	2MG	A	2474	32	18,26,27	1.17	3 (16%)	16,38,41	0.77	0
32	PSU	A	2533	33,32	18,21,22	1.00	1 (5%)	22,30,33	0.75	0
32	5MU	A	1968	32	19,22,23	0.49	0	28,32,35	0.47	0
32	2MA	A	2532	33,32	19,25,26	1.28	2 (10%)	21,37,40	1.93	4 (19%)
32	G7M	A	2603	32	20,26,27	0.99	1 (5%)	17,39,42	0.44	0
32	H2U	A	2478	32	18,21,22	0.66	0	21,30,33	0.74	0
32	OMG	A	2280	1,33,32	18,26,27	1.14	3 (16%)	19,38,41	0.80	0
32	PSU	A	2486	32	18,21,22	0.97	1 (5%)	22,30,33	0.67	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
32	PSU	A	1001	32	-	0/7/25/26	0/2/2/2
32	5MU	A	794	32	-	0/7/25/26	0/2/2/2
32	OMG	A	2582	32	-	0/5/27/28	0/3/3/3
32	5MU	A	620	33,32	-	0/7/25/26	0/2/2/2
32	2MG	A	2474	32	-	0/5/27/28	0/3/3/3
32	PSU	A	2533	33,32	-	0/7/25/26	0/2/2/2
32	5MU	A	1968	32	-	0/7/25/26	0/2/2/2
32	2MA	A	2532	33,32	-	2/3/25/26	0/3/3/3
32	G7M	A	2603	32	-	0/3/25/26	0/3/3/3
32	H2U	A	2478	32	-	0/7/38/39	0/2/2/2
32	OMG	A	2280	1,33,32	-	0/5/27/28	0/3/3/3
32	PSU	A	2486	32	-	0/7/25/26	0/2/2/2

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
32	A	2533	PSU	C6-C5	3.82	1.39	1.35
32	A	2486	PSU	C6-C5	3.74	1.39	1.35
32	A	2532	2MA	C2-N1	3.27	1.39	1.34
32	A	2603	G7M	C8-N9	3.13	1.38	1.33
32	A	1001	PSU	C6-C5	3.11	1.38	1.35

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
32	A	2532	2MA	C5-C6-N1	-5.92	117.12	121.01
32	A	2532	2MA	C5-C6-N6	4.05	126.50	120.35
32	A	2532	2MA	CM2-C2-N1	3.45	122.54	117.15
32	A	2532	2MA	N3-C2-N1	-2.60	120.98	125.73
32	A	620	5MU	O3'-C3'-C4'	-2.33	104.30	111.05

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
32	A	2532	2MA	C4'-C5'-O5'-P
32	A	2532	2MA	O4'-C4'-C5'-O5'

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 15 ligands modelled in this entry, 15 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.