WORLDWIDE PDB
PROTEIN DATA BANK

Full wwPDB EM Validation Report (i)

Feb 10, 2025 – 09:13 PM EST

PDB ID	:	8UT0
EMDB ID	:	EMD-42525
Title	:	Eukaryotic 80S ribosome with Reh1, eIF5A and A/P site tRNA
Authors	:	Yelland, J.N.; Taylor, D.W.; Johnson, A.W.
Deposited on	:	2023-10-30
Resolution	:	3.22 Å(reported)

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

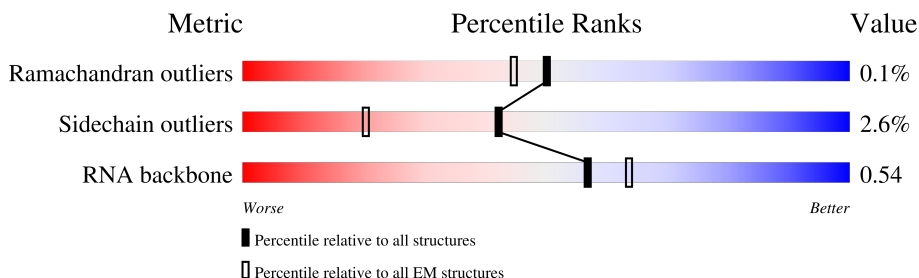|		
EMDB validation analysis	:	0.0.1.dev113
Mogul	:	2022.3.0, CSD as543be (2022)
MolProbity	:	4.02b-467
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

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 3.22 Å.

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

Metric	Percentile Ranks	Value
Ramachandran outliers		0.1%
Sidechain outliers		2.6%
RNA backbone		0.54

Worse   *Better*

▮ Percentile relative to all structures

▯ Percentile relative to all EM structures

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 <=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	2	1800	8% 71% 27% ••
2	SP	206	• 99% •
3	SQ	232	6% 96% ••
4	SE	117	8% 98% •
5	SR	216	• 98% •
6	SA	222	• 97% •
7	SS	258	• 98% •
8	SB	206	9% 99% •
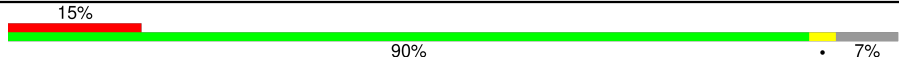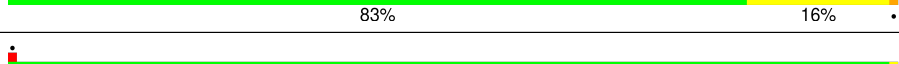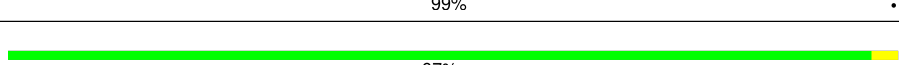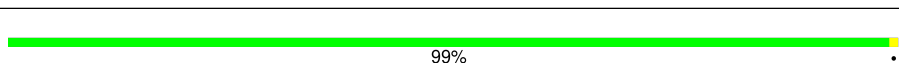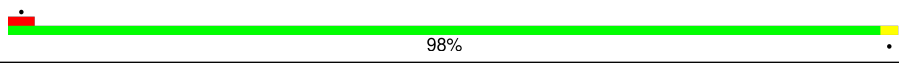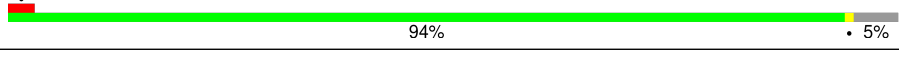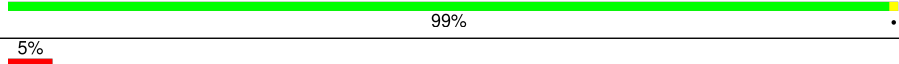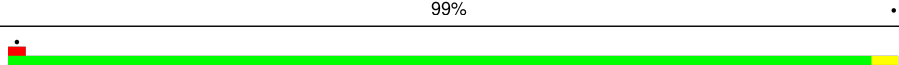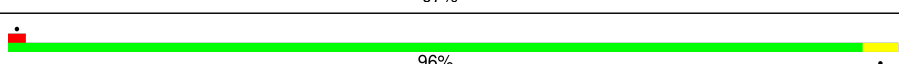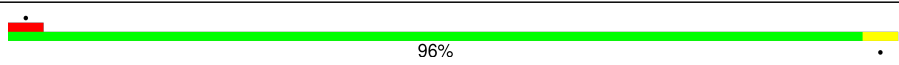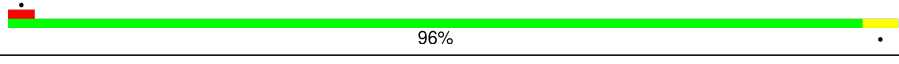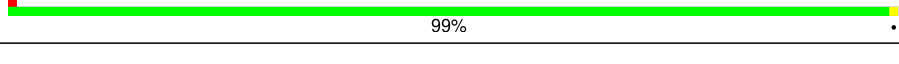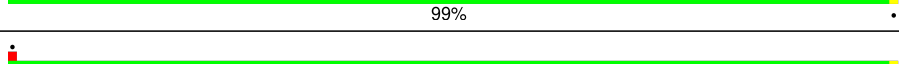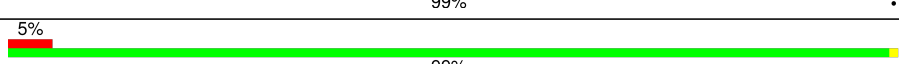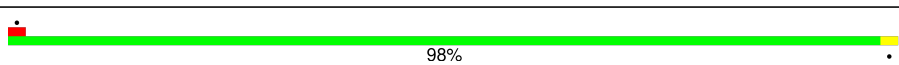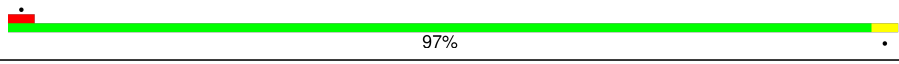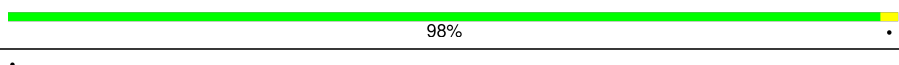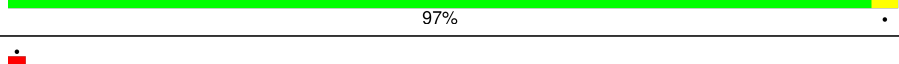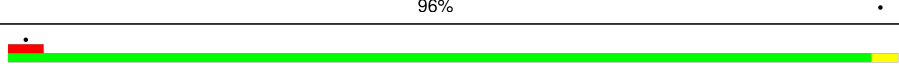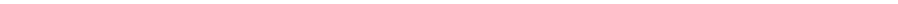
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Mol	Chain	Length	Quality of chain
9	ST	228	6% / 97%
10	SU	184	6% / 98%
11	SV	187	10% / 97%
12	SW	184	99%
13	SC	92	98%
14	SX	142	6% / 97%
15	SD	121	31% / 98%
16	SY	150	99%
17	SZ	127	96%
18	SF	141	94% / 6%
19	SG	125	7% / 94%
20	SH	145	98%
21	SI	143	96%
22	SJ	100	97%
23	Sa	87	98%
24	Sb	129	98%
25	Sc	144	96%
26	Sd	134	99%
27	Se	97	97%
28	Sf	81	99%
29	SM	53	96%
30	Sg	57	7% / 98%
31	SN	73	26% / 93% / 7%
32	SO	312	6% / 97%
33	SL	63	8% / 98%
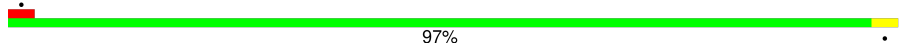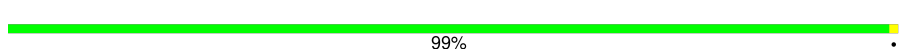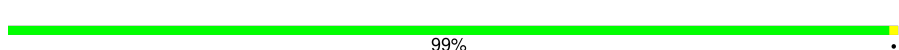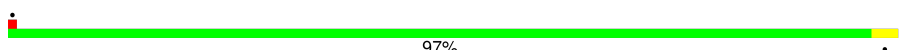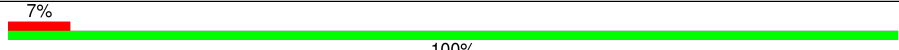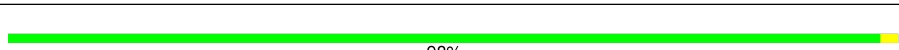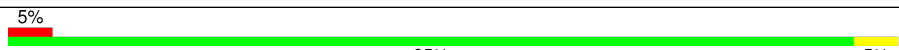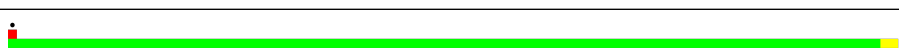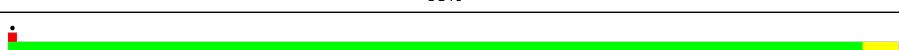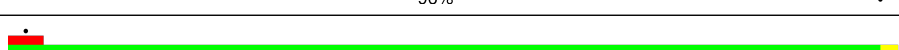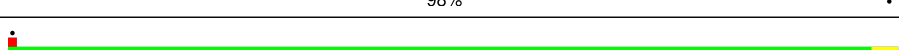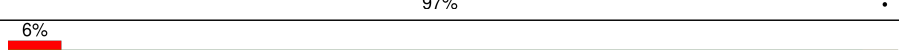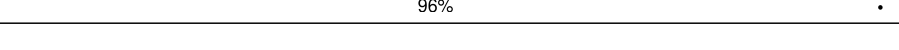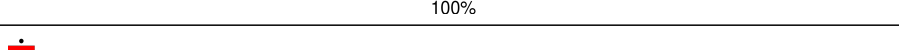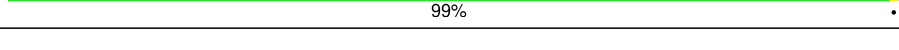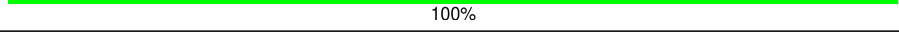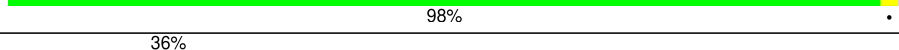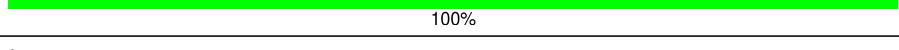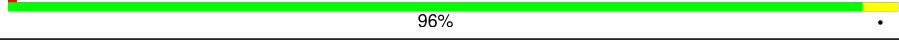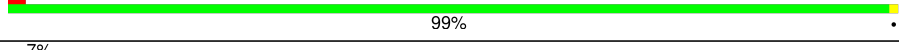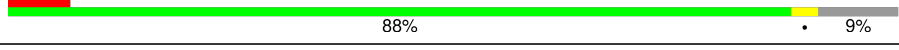
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Mol	Chain	Length	Quality of chain
34	AA	102	15% / 90% / 7%
35	A	3394	76% / 17% / 6%
36	B	121	87% / 13%
37	C	158	83% / 16%
38	LD	251	99%
39	LE	386	97%
40	LF	361	99%
41	LG	294	98%
42	LH	175	94% / 5%
43	LI	222	99%
44	LJ	233	5% / 99%
45	LK	191	97%
46	LL	218	96%
47	LM	169	96%
48	LN	193	96%
49	LO	136	99%
50	LP	203	99%
51	LQ	197	99%
52	LR	183	5% / 99%
53	LS	185	98%
54	LT	188	97%
55	LU	171	98%
56	LV	159	97%
57	LW	100	96%
58	LX	136	97%
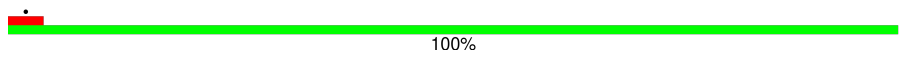
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Mol	Chain	Length	Quality of chain
59	LY	65	97%
60	LZ	121	100%
61	La	125	99%
62	Lb	135	99%
63	Lc	148	97%
64	Ld	58	7% 100%
65	Le	96	98%
66	Lf	109	5% 95% 5%
67	Lg	127	98%
68	Lh	106	96%
69	Li	112	98%
70	Lj	119	97%
71	Lk	99	6% 96%
72	Ll	81	100%
73	Lm	77	99%
74	Ln	50	100%
75	Lo	52	98%
76	Lp	25	36% 100%
77	Lq	103	96%
78	Lr	91	99%
79	Ls	157	7% 88% 9%
80	z	588	10% 90%
81	m	76	66% 32%
82	n	75	75% 23%
83	D	10	60% 40%

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Mol	Chain	Length	Quality of chain
84	E	210	100%

2 Entry composition (i)

There are 85 unique types of molecules in this entry. The entry contains 205193 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 18S rRNA.

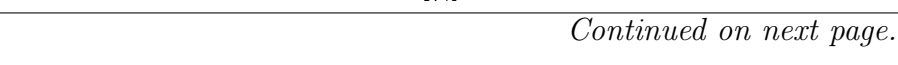| Mol	Chain	Residues	Atoms					AltConf	Trace
1	2	1771	Total 37739	C 16872	N 6683	O 12413	P 1771	0	0

- Molecule 2 is a protein called 40S ribosomal protein S0-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	SP	206	Total 1603	C 1030	N 284	O 287	S 2	0	0

- Molecule 3 is a protein called 40S ribosomal protein S1-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	SQ	226	Total 1798	C 1139	N 330	O 325	S 4	0	0

- Molecule 4 is a protein called 40S ribosomal protein S15.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	SE	117	Total 916	C 583	N 171	O 155	S 7	0	0

- Molecule 5 is a protein called 40S ribosomal protein S2.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	SR	216	Total 1626	C 1042	N 287	O 295	S 2	0	0

- Molecule 6 is a protein called 40S ribosomal protein S3.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	SA	222	Total 1729	C 1098	N 312	O 313	S 6	0	0

- Molecule 7 is a protein called 40S ribosomal protein S4-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	SS	258	Total	C	N	O	S	0	0
			2056	1308	387	358	3		

- Molecule 8 is a protein called 40S ribosomal protein S5.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	SB	206	Total	C	N	O	S	0	0
			1605	1005	299	298	3		

- Molecule 9 is a protein called 40S ribosomal protein S6-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	ST	228	Total	C	N	O	S	0	0
			1815	1138	351	323	3		

- Molecule 10 is a protein called 40S ribosomal protein S7-A.

Mol	Chain	Residues	Atoms				AltConf	Trace
10	SU	184	Total	C	N	O	0	0
			1473	946	263	264		

- Molecule 11 is a protein called 40S ribosomal protein S8-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	SV	187	Total	C	N	O	S	0	0
			1476	916	295	263	2		

- Molecule 12 is a protein called 40S ribosomal protein S9-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	SW	184	Total	C	N	O	S	0	0
			1479	935	285	258	1		

- Molecule 13 is a protein called 40S ribosomal protein S10-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	SC	92	Total	C	N	O	S	0	0
			754	489	122	141	2		

- Molecule 14 is a protein called 40S ribosomal protein S11-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	SX	142	Total 1142	C 733	N 217	O 189	S 3	0	0

- Molecule 15 is a protein called 40S ribosomal protein S12.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	SD	121	Total 875	C 551	N 153	O 169	S 2	0	0

- Molecule 16 is a protein called 40S ribosomal protein S13.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	SY	150	Total 1192	C 759	N 224	O 207	S 2	0	0

- Molecule 17 is a protein called 40S ribosomal protein S14-B.

Mol	Chain	Residues	Atoms					AltConf	Trace
17	SZ	127	Total 923	C 568	N 185	O 167	S 3	0	0

- Molecule 18 is a protein called 40S ribosomal protein S16-A.

Mol	Chain	Residues	Atoms				AltConf	Trace
18	SF	141	Total 1105	C 708	N 203	O 194	0	0

- Molecule 19 is a protein called 40S ribosomal protein S17-B.

Mol	Chain	Residues	Atoms					AltConf	Trace
19	SG	121	Total 948	C 596	N 179	O 171	S 2	0	0

- Molecule 20 is a protein called 40S ribosomal protein S18-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	SH	145	Total 1188	C 741	N 237	O 208	S 2	0	0

- Molecule 21 is a protein called 40S ribosomal protein S19-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
21	SI	143	Total	C	N	O	S	0	0
			1112	694	208	208	2		

- Molecule 22 is a protein called 40S ribosomal protein S20.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	SJ	100	Total	C	N	O	S	0	0
			797	506	144	146	1		

- Molecule 23 is a protein called 40S ribosomal protein S21-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
23	Sa	87	Total	C	N	O	S	0	0
			673	415	125	131	2		

- Molecule 24 is a protein called 40S ribosomal protein S22-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
24	Sb	129	Total	C	N	O	S	0	0
			1021	650	188	180	3		

- Molecule 25 is a protein called 40S ribosomal protein S23-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
25	Sc	144	Total	C	N	O	S	0	0
			1121	708	220	191	2		

- Molecule 26 is a protein called 40S ribosomal protein S24-A.

Mol	Chain	Residues	Atoms				AltConf	Trace
26	Sd	134	Total	C	N	O	0	0
			1032	651	195	186		

- Molecule 27 is a protein called 40S ribosomal protein S26-B.

Mol	Chain	Residues	Atoms					AltConf	Trace
27	Se	97	Total	C	N	O	S	0	0
			765	473	160	127	5		

- Molecule 28 is a protein called 40S ribosomal protein S27-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
28	Sf	81	Total 610	C 382	N 110	O 113	S 5	0	0

- Molecule 29 is a protein called 40S ribosomal protein S29-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
29	SM	53	Total 443	C 275	N 92	O 72	S 4	0	0

- Molecule 30 is a protein called 40S ribosomal protein S30-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
30	Sg	57	Total 451	C 284	N 93	O 73	S 1	0	0

- Molecule 31 is a protein called 40S ribosomal protein S31.

Mol	Chain	Residues	Atoms					AltConf	Trace
31	SN	73	Total 556	C 352	N 105	O 95	S 4	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
SN	97	ALA	LYS	conflict	UNP A0A6A5PU37

- Molecule 32 is a protein called 40S ribosomal protein ASC1.

Mol	Chain	Residues	Atoms					AltConf	Trace
32	SO	312	Total 2383	C 1514	N 409	O 452	S 8	0	0

- Molecule 33 is a protein called 40S ribosomal protein S28-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
33	SL	63	Total 491	C 303	N 96	O 91	S 1	0	0

- Molecule 34 is a protein called 40S ribosomal protein S25-A.

Mol	Chain	Residues	Atoms				AltConf	Trace
34	AA	95	Total 737	C 466	N 139	O 132	0	0

- Molecule 35 is a RNA chain called 25S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
35	A	3184	Total 68091	C 30415	N 12259	O 22233	P 3184	0	0

- Molecule 36 is a RNA chain called 5S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
36	B	121	Total 2579	C 1152	N 461	O 845	P 121	0	0

- Molecule 37 is a RNA chain called 5.8S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
37	C	158	Total 3353	C 1500	N 586	O 1109	P 158	0	0

- Molecule 38 is a protein called 60S ribosomal protein L2-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
38	LD	251	Total 1899	C 1182	N 385	O 331	S 1	0	0

- Molecule 39 is a protein called 60S ribosomal protein L3.

Mol	Chain	Residues	Atoms					AltConf	Trace
39	LE	386	Total 3079	C 1954	N 584	O 533	S 8	0	0

- Molecule 40 is a protein called 60S ribosomal protein L4-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
40	LF	361	Total 2749	C 1730	N 522	O 494	S 3	0	0

- Molecule 41 is a protein called 60S ribosomal protein L5.

Mol	Chain	Residues	Atoms					AltConf	Trace
41	LG	294	Total 2351	C 1484	N 410	O 455	S 2	0	0

- Molecule 42 is a protein called 60S ribosomal protein L6-B.

Mol	Chain	Residues	Atoms				AltConf	Trace
42	LH	167	Total 1307	C 843	N 234	O 230	0	0

- Molecule 43 is a protein called 60S ribosomal protein L7-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
43	LI	222	Total 1784	C 1151	N 324	O 308	S 1	0	0

- Molecule 44 is a protein called 60S ribosomal protein L8-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
44	LJ	233	Total 1804	C 1151	N 323	O 327	S 3	0	0

- Molecule 45 is a protein called 60S ribosomal protein L9-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
45	LK	191	Total 1508	C 957	N 274	O 273	S 4	0	0

- Molecule 46 is a protein called 60S ribosomal protein L10.

Mol	Chain	Residues	Atoms					AltConf	Trace
46	LL	218	Total 1764	C 1117	N 334	O 306	S 7	0	0

- Molecule 47 is a protein called 60S ribosomal protein L11-B.

Mol	Chain	Residues	Atoms					AltConf	Trace
47	LM	169	Total 1346	C 843	N 252	O 247	S 4	0	0

- Molecule 48 is a protein called 60S ribosomal protein L13-A.

Mol	Chain	Residues	Atoms				AltConf	Trace
48	LN	193	Total 1543	C 962	N 315	O 266	0	0

- Molecule 49 is a protein called 60S ribosomal protein L14-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
49	LO	136	Total 1053	C 675	N 199	O 177	S 2	0	0

- Molecule 50 is a protein called 60S ribosomal protein L15-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
50	LP	203	Total 1720	C 1077	N 361	O 281	S 1	0	0

- Molecule 51 is a protein called 60S ribosomal protein L16-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
51	LQ	197	Total 1555	C 1003	N 289	O 262	S 1	0	0

- Molecule 52 is a protein called 60S ribosomal protein L17-A.

Mol	Chain	Residues	Atoms				AltConf	Trace
52	LR	183	Total 1416	C 879	N 284	O 253	0	0

- Molecule 53 is a protein called 60S ribosomal protein L18-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
53	LS	185	Total 1441	C 908	N 290	O 241	S 2	0	0

- Molecule 54 is a protein called 60S ribosomal protein L19-A.

Mol	Chain	Residues	Atoms				AltConf	Trace
54	LT	188	Total 1515	C 932	N 323	O 260	0	0

- Molecule 55 is a protein called 60S ribosomal protein L20-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
55	LU	171	Total 1437	C 925	N 266	O 243	S 3	0	0

- Molecule 56 is a protein called 60S ribosomal protein L21-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
56	LV	159	Total 1272	C 802	N 245	O 221	S 4	0	0

- Molecule 57 is a protein called 60S ribosomal protein L22-A.

Mol	Chain	Residues	Atoms				AltConf	Trace
57	LW	100	Total 796	C 516	N 131	O 149	0	0

- Molecule 58 is a protein called 60S ribosomal protein L23-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
58	LX	136	Total 1003	C 628	N 189	O 179	S 7	0	0

- Molecule 59 is a protein called 60S ribosomal protein L24-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
59	LY	65	Total 528	C 339	N 104	O 84	S 1	0	0

- Molecule 60 is a protein called 60S ribosomal protein L25.

Mol	Chain	Residues	Atoms					AltConf	Trace
60	LZ	121	Total 964	C 620	N 169	O 173	S 2	0	0

- Molecule 61 is a protein called 60S ribosomal protein L26-A.

Mol	Chain	Residues	Atoms				AltConf	Trace
61	La	125	Total 984	C 620	N 191	O 173	0	0

- Molecule 62 is a protein called 60S ribosomal protein L27-A.

Mol	Chain	Residues	Atoms				AltConf	Trace
62	Lb	135	Total 1080	C 701	N 199	O 180	0	0

- Molecule 63 is a protein called 60S ribosomal protein L28.

Mol	Chain	Residues	Atoms					AltConf	Trace
63	Lc	148	Total 1169	C 747	N 231	O 188	S 3	0	0

- Molecule 64 is a protein called 60S ribosomal protein L29.

Mol	Chain	Residues	Atoms				AltConf	Trace
64	Ld	58	Total 462	C 289	N 100	O 73	0	0

- Molecule 65 is a protein called 60S ribosomal protein L30.

Mol	Chain	Residues	Atoms					AltConf	Trace
65	Le	96	Total 737	C 476	N 123	O 137	S 1	0	0

- Molecule 66 is a protein called 60S ribosomal protein L31-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
66	Lf	109	Total 876	C 556	N 167	O 152	S 1	0	0

- Molecule 67 is a protein called 60S ribosomal protein L32.

Mol	Chain	Residues	Atoms					AltConf	Trace
67	Lg	127	Total 1017	C 644	N 205	O 167	S 1	0	0

- Molecule 68 is a protein called 60S ribosomal protein L33-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
68	Lh	106	Total 850	C 540	N 165	O 144	S 1	0	0

- Molecule 69 is a protein called 60S ribosomal protein L34-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
69	Li	112	Total 880	C 545	N 179	O 152	S 4	0	0

- Molecule 70 is a protein called 60S ribosomal protein L35-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
70	Lj	119	Total 969	C 615	N 186	O 167	S 1	0	0

- Molecule 71 is a protein called 60S ribosomal protein L36-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
71	Lk	99	Total 766	C 478	N 154	O 132	S 2	0	0

- Molecule 72 is a protein called 60S ribosomal protein L37-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
72	Ll	81	Total 645	C 393	N 141	O 106	S 5	0	0

- Molecule 73 is a protein called 60S ribosomal protein L38.

Mol	Chain	Residues	Atoms				AltConf	Trace
73	Lm	77	Total 612	C 391	N 115	O 106	0	0

- Molecule 74 is a protein called 60S ribosomal protein L39.

Mol	Chain	Residues	Atoms					AltConf	Trace
74	Ln	50	Total 436	C 272	N 97	O 65	S 2	0	0

- Molecule 75 is a protein called 60S ribosomal protein L40-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
75	Lo	52	Total 410	C 254	N 86	O 65	S 5	0	0

- Molecule 76 is a protein called 60S ribosomal protein L41-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
76	Lp	25	Total 229	C 139	N 62	O 27	S 1	0	0

- Molecule 77 is a protein called 60S ribosomal protein L42-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
77	Lq	103	Total 824	C 517	N 167	O 135	S 5	0	0

- Molecule 78 is a protein called 60S ribosomal protein L43-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
78	Lr	91	Total 694	C 429	N 138	O 121	S 6	0	0

- Molecule 79 is a protein called Translation factor eIF5A.

Mol	Chain	Residues	Atoms					AltConf	Trace
79	Ls	143	Total 1081	C 672	N 181	O 219	S 9	0	0

- Molecule 80 is a protein called Cytoplasmic 60S subunit biogenesis factor REH1 (N-terminal 3xFLAG tag).

Mol	Chain	Residues	Atoms					AltConf	Trace
80	z	57	Total 480	C 295	N 96	O 86	S 3	0	0

- Molecule 81 is a RNA chain called A site tRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
81	m	76	Total 1611	C 721	N 281	O 534	P 75	0	0

- Molecule 82 is a RNA chain called P site initiator tRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
82	n	75	Total 1606	C 716	N 297	O 518	P 75	0	0

There is a discrepancy between the modelled and reference sequences:

| Chain	Residue	Modelled	Actual	Comment	Reference
n	10	A	G	conflict	GB 176433

- Molecule 83 is a RNA chain called Messenger RNA (5'-R(P*AP*AP*UP*AP*UP*GP*AP* AP*AP*A)-3').

Mol	Chain	Residues	Atoms					AltConf	Trace
83	D	10	Total	C	N	O	P	0	0
			213	98	44	61	10		

- Molecule 84 is a protein called 60S ribosomal protein L1.

Mol	Chain	Residues	Atoms				AltConf	Trace
84	E	210	Total	C	N	O	0	0
			1051	630	210	211		

- Molecule 85 is 4-{(2R)-2-[(1S,3S,5S)-3,5-dimethyl-2-oxocyclohexyl]-2-hydroxyethyl}piperidine-2,6-dione (three-letter code: 3HE) (formula: $C_{15}H_{23}NO_4$).
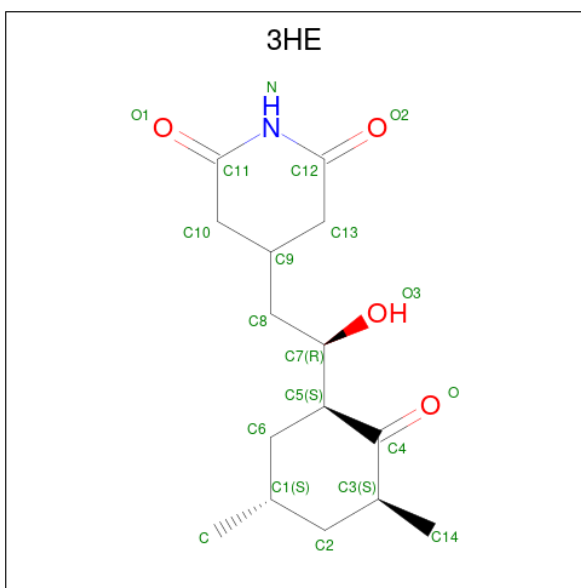
Mol	Chain	Residues	Atoms				AltConf
85	A	1	Total	C	N	O	0
			20	15	1	4	

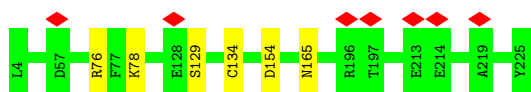# 3　Residue-property plots　ⓘ

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.
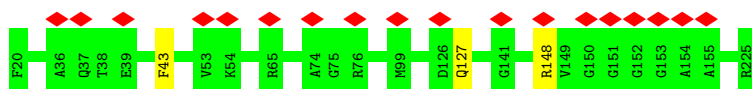
- Molecule 1: 18S rRNA

G1100 A1113 A1138 A1143 C1158 C1159 A1160 G1164 G1167 G1170 U1185 A1194 C1195 A1196 G1199 G1200 G1201 A1202 U1214 A1217 G1218 A1226 A1227 G1228 G1229 A1230 U1231 A1234 C1235 G1241 A1244 G1245 C1246 U1251 C1252 A1256 U1257 U1258 G1263 G1273

C1274 A1275 C1284 U1285 U1286 U1301 U1307 U1308 U1314 U1315 G1318 A1321 A1322 A1344 A1345 A1346 U1347 A1348 G1349 A1360 U1361 U1362 U1363 U1370 A1371 U1372 C1373 U1381 A1382 G1383 A1388 C1389 U1390 U1398 U1399 A1400 A1401 G1402 U1413 U1414 U1415 A1427 U1430 C1431 U1432

G1433 A1436 A1446 C1447 G1448 G1458 C1459 A1460 G1466 A1469 C1470 A1471 C1472 U1473 G1474 G1478 C1490 U1491 A1492 U1496 G1506 U1514 A1515 A1516 U1520 G1521 U1522 G1523 A1524 C1527 U1528 G1534 U1535 G1536 C1537 G1540 A1543 U1544 A1545 U1557 U1558 A1559 U1560

A1569 A1570 A1573 G1574 G1575 A1576 A1583 G1584 G1588 C1589 G1590 A1600 G1601 A1614 A1633 C1634 A1635 C1636 C1637 A1655 U1656 U1657 G1658 G1680 A1681 U1688 G1689 G1690 A1691 G1692 A1693 A1694 G1695 G1696 G1697 G1698 G1699 C1700 A1701 A1702 C1703 U1704 C1705 C1706 A1707 U1708 C1709 U1710 C1711 G1715

C1716 G1717 A1731 A1755 A1756 G1757 U1758 C1759 G1760 U1761 A1762 A1766 G1767 G1768 U1769 U1780 A1781 A1782 C1783 G1792 G1793 A1794 U1795 C1796 U1799 A

• Molecule 2: 40S ribosomal protein S0-A

Chain SP:
99%

S2 A5 N28 H32 S78 D157 P207

• Molecule 3: 40S ribosomal protein S1-A

Chain SQ:
6%
96%

A2 V3 G4 K5 N6 K7 R8 L9 S10 K11 G12 K13 LYS GLY GLN LYS ARG V20 R26 K50 G53 D59 G63 Y133 S158 S159 H160 G233

• Molecule 4: 40S ribosomal protein S15

Chain SE:
8%
98%

K13 D21 T50 S51 K52 P53 N70 E71 S92 L116 G129

• Molecule 5: 40S ribosomal protein S2

Chain SR:
98%

G34 D78 L148 C162 R174 D195 A249

• Molecule 6: 40S ribosomal protein S3

Chain SA:

97%

L4 D57 R76 F77 K78 E128 S129 C134 D154 N165 R196 T197 E213 E214 A219 Y225

• Molecule 7: 40S ribosomal protein S4-A

Chain SS:

98%

A2 K22 D88 Y121 N153 R187 S213 N216 F226 Q259

• Molecule 8: 40S ribosomal protein S5

9%

Chain SB:

99%

F20 A36 Q37 T38 E39 F43 V53 K54 R65 A74 G75 R76 M99 D126 Q127 G141 R148 V149 G150 G151 G152 G153 A154 A155 R225

• Molecule 9: 40S ribosomal protein S6-A

6%

Chain ST:

97%

M1 D19 H22 D43 K46 K58 D105 K115 K116 N140 S148 K149 D155 K164 G165 E166 Y169 E222 K223 A224 E225 I226 R227 K228

• Molecule 10: 40S ribosomal protein S7-A

6%

Chain SU:

98%

P4 A12 E17 N29 E33 L34 K35 A36 G53 T105 S106 R107 Q108 D123 I135 D158 S187

• Molecule 11: 40S ribosomal protein S8-A

10%

Chain SV:

97%

G2 R18 A40 N52 E89 D105 E114 G122 K123 K135 S136 K137 N138 A139 E140 R141 K142 A145 R146 K151 R164 C168 R195 A198 K199

• Molecule 12: 40S ribosomal protein S9-A

Chain SW:

99%

P2 R3 K65 D157 A183 S184 G185

• Molecule 13: 40S ribosomal protein S10-A

Chain SC:

98%

M1 E6 Q13 A30 E34 N81 I92

• Molecule 14: 40S ribosomal protein S11-A

Chain SX:

6%

97%

E4 L5 K24 T27 S28 K29 R30 E50 L63 R67 N138 A144 A145

• Molecule 15: 40S ribosomal protein S12

Chain SD:

31%

98%

T23 I24 V31 L32 R33 L36 D39 A51 L52 G55 E56 V63 E68 A69 N70 I71 V75 E76 A79 E83 N84 K85 V86 P87 L88 A92 D93 A94 K95 G104 R108 E109 G110 N111 A112 N125 W126 G127 A128 E129 T130 D131 H139 F140 S141

Q142 Q143

• Molecule 16: 40S ribosomal protein S13

Chain SY:

99%

G2 N105 D110 N151

• Molecule 17: 40S ribosomal protein S14-B

Chain SZ:

96%

S11 M61 D66 T89 R136 L137

• Molecule 18: 40S ribosomal protein S16-A

Chain SF:

94%

6%

A3 F10 K26 N32 L44 E50 R68 Q94 K102 F129 G130 G131 R137 R143

• Molecule 19: 40S ribosomal protein S17-B

Chain SG:

7%

94%

G2 R5 C35 K63 R67 E77 R78 E79 R80 K81 D82 R95 SER ASN GLY VAL L100 N123 V124 S125 A126
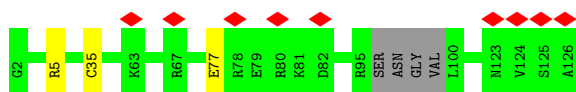
• Molecule 20: 40S ribosomal protein S18-A

Chain SH:

98%

S2 L3 D23 C47 D51 E64 D111 A146

• Molecule 21: 40S ribosomal protein S19-A

Chain SI:

96%

P2 S5 A10 N43 L105 L108 R130 D131 L132 D133 D143 E144

• Molecule 22: 40S ribosomal protein S20

Chain SJ:

97%

I20 K52 S66 Y90 Q98 A119

• Molecule 23: 40S ribosomal protein S21-A

Chain Sa:

98%

M1 N21 D76 R87

• Molecule 24: 40S ribosomal protein S22-A

Chain Sb:

98%

T2 R3 D85 L94 Y130
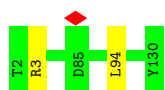
• Molecule 25: 40S ribosomal protein S23-A

Chain Sc:

96%

G2 H18 S61 N65 N89 D97 F107 G108 R109 R144 S145
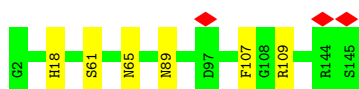
• Molecule 26: 40S ribosomal protein S24-A

Chain Sd:

99%

S2 F58 R93 V100 R124 A134 D135
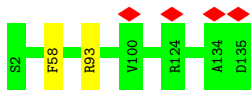
• Molecule 27: 40S ribosomal protein S26-B

Chain Se:

97%

P2 N8 C26 E61 Y68 P98
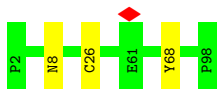
• Molecule 28: 40S ribosomal protein S27-A

Chain Sf:

99%

V2 L33 G39 K82
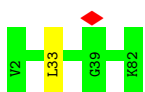
• Molecule 29: 40S ribosomal protein S29-A

Chain SM:

96%

E4 S26 D49 R56
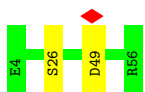
• Molecule 30: 40S ribosomal protein S30-A

7%

Chain Sg:

98%

H5 G6 T48 L49 G59 P60 S61
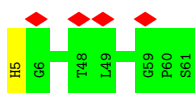
• Molecule 31: 40S ribosomal protein S31

26%

Chain SN:

93%

7%

R80 K81 K82 K83 T87 I91 L100 L103 Y106 K107 V108 D109 A110 E111 G112 K113 V114 T115 E120 G127 F131 D137 R138 H145 S146 V147 N151 A152
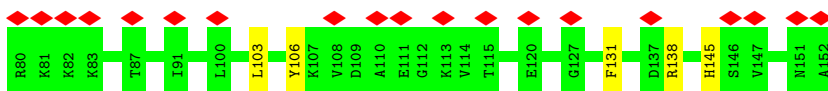
• Molecule 32: 40S ribosomal protein ASC1

6%

Chain SO:

97%
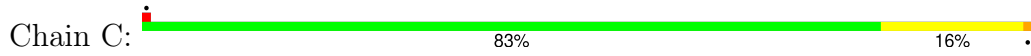
• Molecule 33: 40S ribosomal protein S28-A

Chain SL:

8%

98%

• Molecule 34: 40S ribosomal protein S25-A

Chain AA:

15%

90%   7%

• Molecule 35: 25S rRNA

Chain A:

76%   17%   6%

• Molecule 36: 5S rRNA

Chain B:

G1 G7 C10 A22 C26 C35 C39 A42 G52 U53 G65 C73 C74 A102 G112 C120 U121

• Molecule 37: 5.8S rRNA

Chain C:

83% 16%

A1 U23 U34 C35 A48 A59 C62 G63 A80 U81 U82 C83 C84 G85 U86 G87 U90 C91 G95 A96 A97 A104 A105 C106 U112 U125 A126 A138 G148 G152 U158
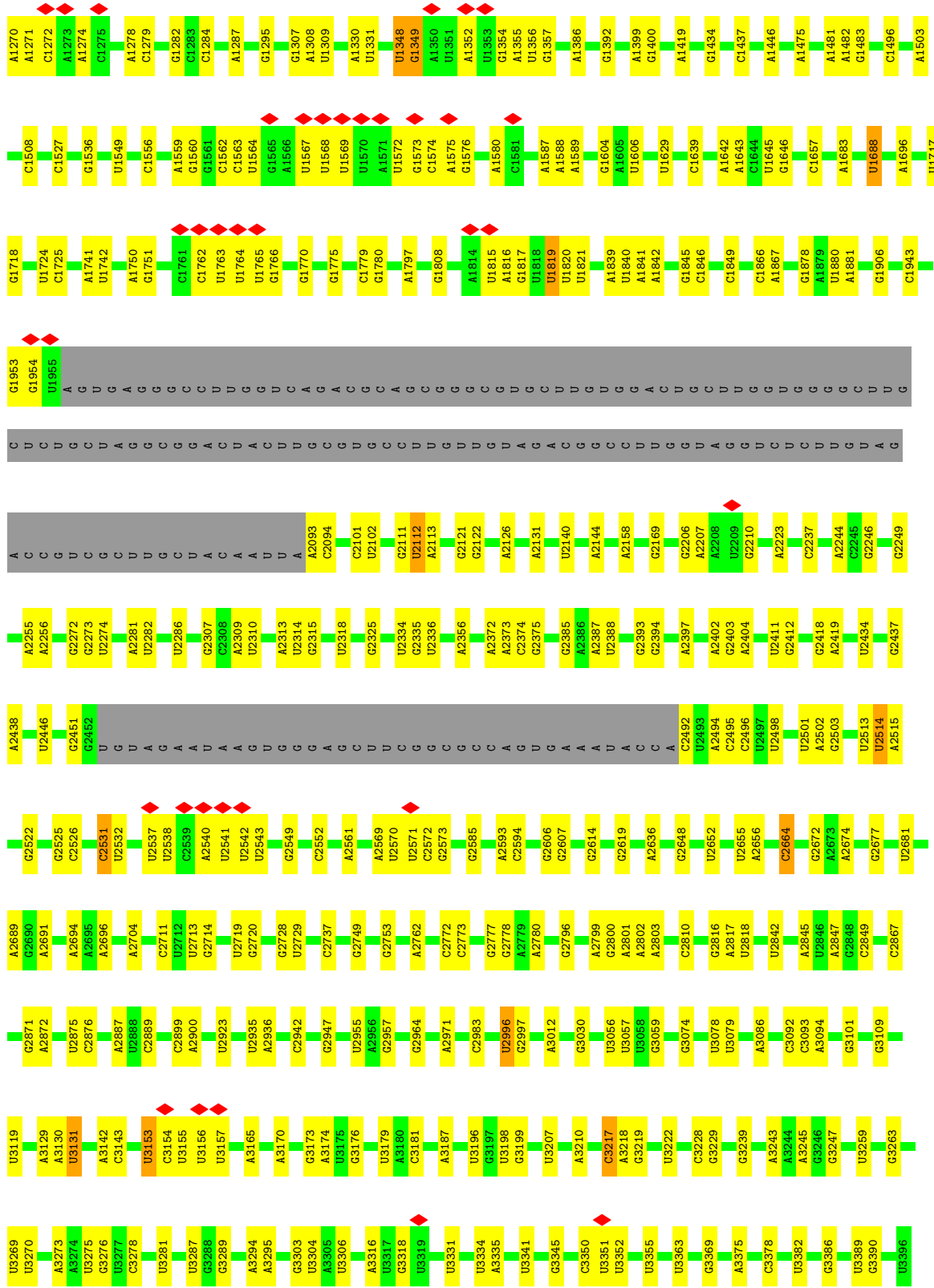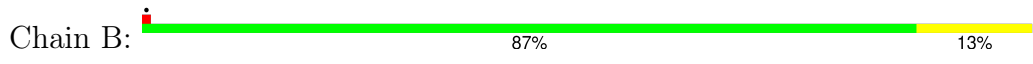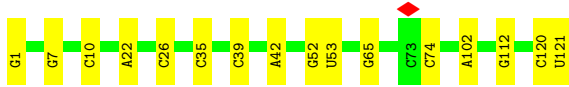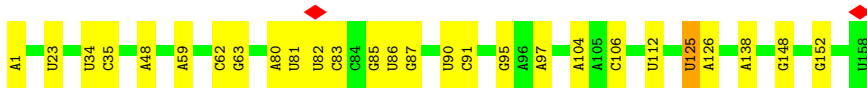
• Molecule 38: 60S ribosomal protein L2-A

Chain LD:

99%

G2 Y69 S114 R149 K251 T252

• Molecule 39: 60S ribosomal protein L3

Chain LE:

97%

S2 R10 D59 L60 D61 L110 Y137 D140 Q211 N319 R332 S347 D360 L387

• Molecule 40: 60S ribosomal protein L4-A

Chain LF:

99%

S2 M93 R98 K104 Y120 R141 D362

• Molecule 41: 60S ribosomal protein L5

Chain LG:

98%

Q4 K5 D6 A7 Q111 E124 L131 L146 T153 F185 E209 R218 D232 R248 L293 Q297
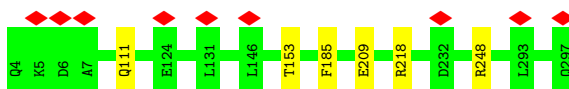
• Molecule 42: 60S ribosomal protein L6-B

Chain LH:

94% 5%

T2 S88 K110 L111 K114 E118 A119 N120 LEU PHE PRO GLU GLN GLN THR LYS E129 D169 F176
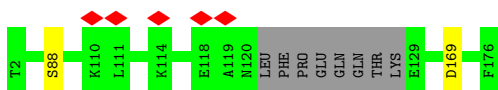
• Molecule 43: 60S ribosomal protein L7-A

Chain LI:

99%

A23 Y75 S142 D183 N244
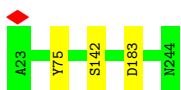
• Molecule 44: 60S ribosomal protein L8-A

Chain LJ:

5%

99%

N24 D83 A115 V116 A117 E118 G119 K120 D124 K147 M173 A250 K251 N252 S253 D254 S255 A256
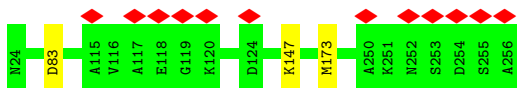
• Molecule 45: 60S ribosomal protein L9-A

Chain LK:

97%

M1 K63 D76 Y86 Y92 L146 D171 D190 L191

• Molecule 46: 60S ribosomal protein L10

Chain LL:

96%

A2 S20 R24 D28 S29 L36 E45 S54 N55 M102 Q113 H123 K184 S201 A219

• Molecule 47: 60S ribosomal protein L11-B

Chain LM:

96%

Q6 L17 E25 S26 G27 D28 N62 D111 Y116 R137 Y167 D168 A169 D173 K174

• Molecule 48: 60S ribosomal protein L13-A

Chain LN:

96%

A2 K31 A47 L85 R104 D110 Q120 N129 E134 N162 A187 R188 E192 A193 E194
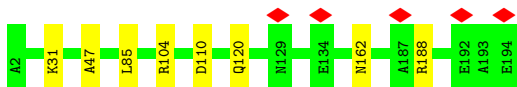
• Molecule 49: 60S ribosomal protein L14-A

Chain LO:

99%

T3 A9 W12 T80 A138
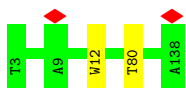
• Molecule 50: 60S ribosomal protein L15-A

Chain LP:

99%

G2 N90 S125 Q138 K204
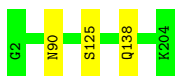
• Molecule 51: 60S ribosomal protein L16-A

Chain LQ:

99%

V3 R117 E187 S188 D189 Y199
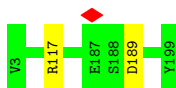
• Molecule 52: 60S ribosomal protein L17-A

5%

Chain LR:

99%

A2 E155 A156 V157 A158 K159 A160 A161 E162 K163 K164 K180 A184
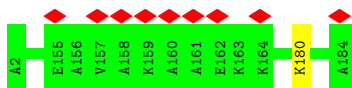
• Molecule 53: 60S ribosomal protein L18-A

Chain LS:

98%

G2 I3 D4 A18 D22 S55 S63 N78 N145 V186

• Molecule 54: 60S ribosomal protein L19-A

Chain LT:

97%

A2 R20 S69 S76 E86 R163 R181 D182 K186 E187 D188 A189

• Molecule 55: 60S ribosomal protein L20-A
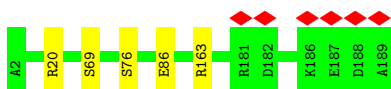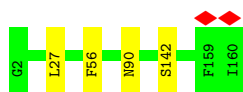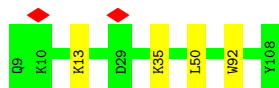
Chain LU:

98%

A2 Y43 Y81 E128 Y172

• Molecule 56: 60S ribosomal protein L21-A

Chain LV:

97%

• Molecule 57: 60S ribosomal protein L22-A

Chain LW:

• Molecule 58: 60S ribosomal protein L23-A

Chain LX:
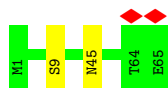

• Molecule 59: 60S ribosomal protein L24-A

Chain LY:

• Molecule 60: 60S ribosomal protein L25
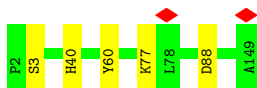
Chain LZ:

• Molecule 61: 60S ribosomal protein L26-A

Chain La:

• Molecule 62: 60S ribosomal protein L27-A

Chain Lb:

• Molecule 63: 60S ribosomal protein L28

Chain Lc:

97%

P2 S3 H40 Y60 K77 L78 D88 A149

• Molecule 64: 60S ribosomal protein L29

7%

Chain Ld:

100%

A2 K33 D36 K58 K59

• Molecule 65: 60S ribosomal protein L30

Chain Le:

98%

S9 K19 Y23 L104

• Molecule 66: 60S ribosomal protein L31-A

5%

Chain Lf:

95%　　　　　　　　　　　　　　　　　　　　　5%

L4 K38 T46 D47 E83 D84 A85 K86 S100 E111 D112

• Molecule 67: 60S ribosomal protein L32

Chain Lg:

98%

A2 D81 L126 A127 L128

• Molecule 68: 60S ribosomal protein L33-A

Chain Lh:

96%

A2 R18 S19 S62 R73 I107

• Molecule 69: 60S ribosomal protein L34-A

Chain Li:
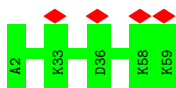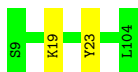
98%

A2 S55 K106 E107 Q108 T109 E110 A111 A112 K113

• Molecule 70: 60S ribosomal protein L35-A

Chain Lj:

• Molecule 71: 60S ribosomal protein L36-A

Chain Lk:

• Molecule 72: 60S ribosomal protein L37-A

Chain Ll:

There are no outlier residues recorded for this chain.

• Molecule 73: 60S ribosomal protein L38

Chain Lm:

• Molecule 74: 60S ribosomal protein L39

Chain Ln:
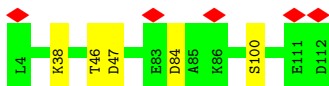
There are no outlier residues recorded for this chain.
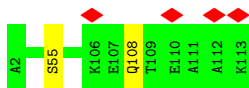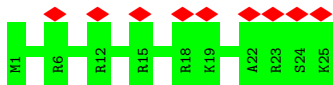
• Molecule 75: 60S ribosomal protein L40-A

Chain Lo:

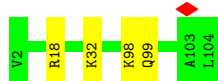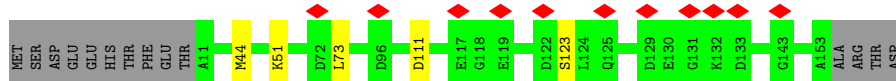• Molecule 76: 60S ribosomal protein L41-A

Chain Lp:

• Molecule 77: 60S ribosomal protein L42-A

Chain Lq:

96%

V2 R18 K32 K98 Q99 A103 L104

• Molecule 78: 60S ribosomal protein L43-A

Chain Lr:

99%

A2 S72 E91 A92

• Molecule 79: Translation factor eIF5A

7%

Chain Ls:

88%　　9%

MET SER ASP GLU GLU HIS THR PHE GLU THR A11 M44 K51 D72 L73 D96 D111 E117 G118 E119 D122 S123 L124 Q125 D129 E130 G131 K132 D133 G143 A153 ALA ARG THR ASP

• Molecule 80: Cytoplasmic 60S subunit biogenesis factor REH1 (N-terminal 3xFLAG tag)

Chain z:

10%　　90%

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

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

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

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

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

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

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

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

GLU ASN ASP ILE ASN ALA ASN TYR THR THR VAL SER SER ILE ASP GLU SER GLY LEU GLU LEU THR LEU PRO THR GLY ALA ARG LEU GLY HIS ARG ALA GLY GLN ARG TYR TYR ARG GLN ASN LEU PRO SER GLN PRO ASN ASN PRO ASN GLU SER ARG R376 K399 L431 Q432
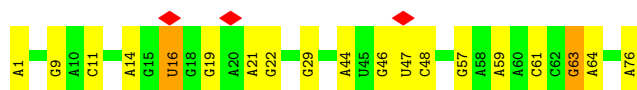
• Molecule 81: A site tRNA

Chain m:

66%   32%

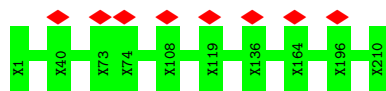● Molecule 82: P site initiator tRNA

Chain n:

75%   23%

● Molecule 83: Messenger RNA (5'-R(P*AP*AP*UP*AP*UP*GP*AP*AP*AP*A)-3')

Chain D:

60%   40%

● Molecule 84: 60S ribosomal protein L1

Chain E:

100%

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	23734	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 $(e^-/\text{Å}^2)$	70	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.629	Depositor
Minimum map value	-0.337	Depositor
Average map value	-0.001	Depositor
Map value standard deviation	0.027	Depositor
Recommended contour level	0.0875	Depositor
Map size (Å)	524.88, 524.88, 524.88	wwPDB
Map dimensions	648, 648, 648	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.81, 0.81, 0.81	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: 5CT, 3HE

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	2	0.65	0/42211	0.89	34/65773 (0.1%)
2	SP	0.36	0/1644	0.54	0/2249
3	SQ	0.34	0/1823	0.56	0/2447
4	SE	0.33	0/936	0.58	0/1259
5	SR	0.39	0/1656	0.55	0/2251
6	SA	0.34	0/1754	0.60	0/2361
7	SS	0.39	0/2097	0.59	0/2823
8	SB	0.33	0/1625	0.60	0/2197
9	ST	0.33	0/1839	0.60	0/2460
10	SU	0.33	0/1498	0.60	1/2019 (0.0%)
11	SV	0.39	0/1501	0.61	0/2006
12	SW	0.34	0/1504	0.61	0/2016
13	SC	0.40	0/772	0.55	0/1044
14	SX	0.45	0/1168	0.62	0/1575
15	SD	0.27	0/883	0.52	0/1199
16	SY	0.36	0/1215	0.55	0/1638
17	SZ	0.35	0/934	0.61	0/1257
18	SF	0.36	0/1125	0.60	0/1510
19	SG	0.32	0/957	0.62	0/1283
20	SH	0.34	0/1207	0.60	0/1623
21	SI	0.34	0/1130	0.57	0/1517
22	SJ	0.34	0/807	0.56	0/1091
23	Sa	0.39	0/682	0.60	0/921
24	Sb	0.42	0/1038	0.59	0/1395
25	Sc	0.40	0/1139	0.58	0/1518
26	Sd	0.38	0/1046	0.58	0/1401
27	Se	0.37	0/778	0.60	0/1042
28	Sf	0.36	0/620	0.56	0/838
29	SM	0.40	0/453	0.59	0/602
30	Sg	0.34	0/459	0.60	0/611
31	SN	0.33	0/567	0.67	1/764 (0.1%)
32	SO	0.31	0/2436	0.59	0/3318

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#|Z| >5	RMSZ	#|Z| >5
33	SL	0.34	0/493	0.70	0/663
34	AA	0.31	0/744	0.58	0/991
35	A	0.77	0/76214	0.88	42/118821 (0.0%)
36	B	0.62	0/2883	0.84	1/4491 (0.0%)
37	C	0.83	0/3746	0.85	2/5832 (0.0%)
38	LD	0.45	0/1933	0.62	0/2598
39	LE	0.45	0/3150	0.58	0/4236
40	LF	0.42	0/2801	0.57	0/3792
41	LG	0.36	0/2400	0.57	0/3239
42	LH	0.39	0/1329	0.54	0/1794
43	LI	0.41	0/1821	0.53	0/2451
44	LJ	0.39	0/1836	0.56	0/2481
45	LK	0.40	0/1529	0.60	0/2060
46	LL	0.41	0/1801	0.60	0/2416
47	LM	0.35	0/1367	0.64	0/1834
48	LN	0.40	0/1568	0.61	1/2106 (0.0%)
49	LO	0.36	0/1068	0.56	0/1438
50	LP	0.48	0/1757	0.64	0/2354
51	LQ	0.43	0/1585	0.55	0/2128
52	LR	0.44	0/1439	0.58	0/1938
53	LS	0.39	0/1465	0.61	0/1965
54	LT	0.38	0/1532	0.58	0/2043
55	LU	0.44	0/1473	0.57	0/1980
56	LV	0.39	0/1296	0.56	0/1739
57	LW	0.41	0/812	0.62	1/1099 (0.1%)
58	LX	0.45	0/1018	0.60	0/1369
59	LY	0.41	0/540	0.54	0/717
60	LZ	0.47	0/979	0.58	0/1321
61	La	0.41	0/995	0.55	0/1329
62	Lb	0.44	0/1106	0.54	0/1485
63	Lc	0.42	0/1200	0.62	0/1607
64	Ld	0.31	0/473	0.48	0/629
65	Le	0.43	0/745	0.53	0/1001
66	Lf	0.42	0/890	0.59	0/1196
67	Lg	0.42	0/1038	0.60	0/1390
68	Lh	0.48	0/868	0.61	0/1168
69	Li	0.48	0/890	0.62	0/1189
70	Lj	0.39	0/978	0.57	0/1301
71	Lk	0.33	0/772	0.60	0/1026
72	Ll	0.46	0/660	0.62	0/875
73	Lm	0.38	0/618	0.61	0/826
74	Ln	0.43	0/443	0.65	0/588
75	Lo	0.38	0/416	0.56	0/553

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#|Z| >5	RMSZ	#|Z| >5
76	Lp	0.30	0/230	0.68	0/296
77	Lq	0.41	0/836	0.60	0/1104
78	Lr	0.44	0/701	0.60	0/934
79	Ls	0.33	0/1080	0.60	1/1452 (0.1%)
80	z	0.38	0/483	0.61	0/640
81	m	0.58	0/1799	1.02	3/2801 (0.1%)
82	n	1.15	1/1796 (0.1%)	1.00	6/2799 (0.2%)
83	D	0.68	0/240	1.02	0/368
All	All	0.62	1/219340 (0.0%)	0.79	93/322461 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
82	n	16	U	O3'-P	42.52	2.12	1.61

All (93) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
82	n	16	U	P-O3'-C3'	-17.22	99.04	119.70
35	A	2094	C	N3-C2-O2	-10.12	114.81	121.90
82	n	16	U	C5-C4-O4	8.83	131.19	125.90
35	A	2094	C	N1-C2-O2	7.89	123.63	118.90
35	A	3278	C	N1-C2-O2	7.59	123.45	118.90
81	m	53	G	N3-C4-N9	-7.41	121.55	126.00
35	A	3153	U	N1-C2-O2	7.25	127.88	122.80
35	A	162	G	N3-C4-N9	-7.22	121.67	126.00
35	A	1496	C	C2-N1-C1'	7.01	126.52	118.80
10	SU	34	LEU	CA-CB-CG	6.93	131.23	115.30
1	2	726	C	OP1-P-OP2	-6.87	109.30	119.60
1	2	141	U	C2-N1-C1'	6.76	125.82	117.70
1	2	1347	U	C2-N1-C1'	6.71	125.75	117.70
1	2	1	U	OP1-P-OP2	-6.70	109.55	119.60
35	A	2093	A	OP1-P-OP2	-6.66	109.61	119.60
1	2	1389	C	C2-N1-C1'	6.63	126.09	118.80
1	2	141	U	N3-C2-O2	-6.63	117.56	122.20
35	A	486	A	OP1-P-OP2	-6.57	109.75	119.60
82	n	1	A	OP1-P-OP2	-6.57	109.75	119.60
1	2	1347	U	N1-C2-O2	6.54	127.38	122.80
1	2	676	G	OP1-P-OP2	-6.52	109.83	119.60
37	C	1	A	OP1-P-OP2	-6.49	109.87	119.60
35	A	3153	U	C2-N1-C1'	6.34	125.31	117.70
35	A	3153	U	N3-C2-O2	-6.33	117.77	122.20

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
35	A	3	U	OP1-P-OP2	-6.27	110.19	119.60
1	2	141	U	N1-C2-O2	6.27	127.19	122.80
35	A	2492	C	OP1-P-OP2	-6.26	110.21	119.60
1	2	1699	G	O4'-C1'-N9	6.23	113.18	108.20
35	A	1348	U	OP1-P-O3'	6.22	118.89	105.20
35	A	2664	C	C2-N1-C1'	6.21	125.63	118.80
35	A	3278	C	C2-N1-C1'	6.18	125.60	118.80
35	A	1819	U	C2-N1-C1'	6.11	125.03	117.70
1	2	934	C	C2-N1-C1'	6.08	125.48	118.80
1	2	965	U	C2-N1-C1'	6.07	124.98	117.70
36	B	1	G	OP1-P-OP2	-6.04	110.54	119.60
82	n	16	U	OP1-P-O3'	6.00	118.41	105.20
1	2	484	C	C2-N3-C4	-5.97	116.91	119.90
35	A	260	C	N3-C2-O2	-5.96	117.73	121.90
35	A	1348	U	P-O3'-C3'	5.95	126.84	119.70
35	A	3217	C	C2-N1-C1'	5.95	125.34	118.80
35	A	3217	C	N1-C2-O2	5.94	122.47	118.90
1	2	959	U	C5-C6-N1	5.87	125.64	122.70
37	C	125	U	C2-N1-C1'	5.81	124.68	117.70
31	SN	103	LEU	CA-CB-CG	5.80	128.65	115.30
35	A	922	U	C2-N1-C1'	5.78	124.64	117.70
1	2	1527	C	C2-N1-C1'	5.74	125.11	118.80
57	LW	50	LEU	CA-CB-CG	5.72	128.46	115.30
35	A	2531	C	C2-N1-C1'	5.69	125.06	118.80
35	A	3278	C	N3-C2-O2	-5.68	117.92	121.90
35	A	1604	G	C4-N9-C1'	5.67	133.87	126.50
1	2	1347	U	N3-C2-O2	-5.67	118.23	122.20
35	A	1496	C	C6-N1-C1'	-5.64	114.03	120.80
1	2	411	C	N3-C2-O2	-5.59	117.98	121.90
1	2	848	C	C2-N3-C4	-5.59	117.10	119.90
1	2	824	G	N3-C2-N2	-5.58	115.99	119.90
1	2	1560	U	C2-N1-C1'	5.55	124.36	117.70
82	n	63	G	C4-N9-C1'	5.54	133.70	126.50
81	m	53	G	N3-C4-C5	5.53	131.37	128.60
1	2	1023	A	P-O3'-C3'	5.39	126.17	119.70
81	m	60	U	C2-N1-C1'	5.36	124.14	117.70
1	2	240	U	N1-C2-O2	5.35	126.55	122.80
48	LN	110	ASP	CB-CG-OD1	5.32	123.09	118.30
35	A	2711	C	N3-C2-O2	-5.32	118.18	121.90
1	2	172	C	N1-C2-O2	5.30	122.08	118.90
1	2	1692	G	C4-N9-C1'	5.29	133.38	126.50
1	2	322	G	P-O3'-C3'	5.29	126.04	119.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
35	A	2772	C	N1-C2-O2	5.28	122.07	118.90
1	2	1633	A	OP2-P-O3'	5.27	116.80	105.20
82	n	63	G	C8-N9-C1'	-5.26	120.17	127.00
35	A	1222	G	O4'-C1'-N9	5.23	112.39	108.20
1	2	1258	U	N3-C2-O2	-5.21	118.55	122.20
35	A	1688	U	N1-C2-O2	5.21	126.45	122.80
1	2	277	U	C2-N1-C1'	5.19	123.92	117.70
35	A	3131	U	C2-N1-C1'	5.19	123.92	117.70
35	A	406	G	O4'-C1'-N9	5.18	112.34	108.20
35	A	2112	U	OP2-P-O3'	5.17	116.58	105.20
1	2	411	C	N1-C2-O2	5.16	121.99	118.90
1	2	1527	C	C6-N1-C1'	-5.15	114.62	120.80
1	2	484	C	O4'-C1'-N1	5.13	112.30	108.20
1	2	178	U	P-O3'-C3'	5.12	125.85	119.70
35	A	487	U	C2-N1-C1'	5.11	123.83	117.70
35	A	2237	C	N3-C2-O2	-5.11	118.33	121.90
35	A	1604	G	C8-N9-C1'	-5.11	120.36	127.00
79	Ls	111	ASP	CB-CG-OD1	5.10	122.89	118.30
35	A	2514	U	OP1-P-O3'	5.08	116.38	105.20
1	2	711	U	P-O3'-C3'	5.06	125.77	119.70
1	2	240	U	C2-N1-C1'	5.06	123.77	117.70
35	A	922	U	N1-C2-O2	5.05	126.33	122.80
35	A	2772	C	N3-C2-O2	-5.04	118.37	121.90
35	A	2996	U	N3-C2-O2	-5.03	118.68	122.20
35	A	3306	U	N3-C2-O2	-5.02	118.69	122.20
35	A	1349	G	N3-C4-N9	5.02	129.01	126.00
35	A	2112	U	P-O3'-C3'	5.00	125.71	119.70

There are no chirality outliers.

There are no planarity outliers.

5.2   Too-close contacts ⓘ

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

5.3   Torsion angles ⓘ

5.3.1   Protein backbone ⓘ

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	SP	204/206 (99%)	188 (92%)	16 (8%)	0	100	100
3	SQ	222/232 (96%)	208 (94%)	14 (6%)	0	100	100
4	SE	115/117 (98%)	108 (94%)	7 (6%)	0	100	100
5	SR	214/216 (99%)	207 (97%)	6 (3%)	1 (0%)	25	59
6	SA	220/222 (99%)	209 (95%)	11 (5%)	0	100	100
7	SS	256/258 (99%)	236 (92%)	20 (8%)	0	100	100
8	SB	204/206 (99%)	193 (95%)	11 (5%)	0	100	100
9	ST	226/228 (99%)	216 (96%)	10 (4%)	0	100	100
10	SU	182/184 (99%)	173 (95%)	8 (4%)	1 (0%)	25	59
11	SV	183/187 (98%)	174 (95%)	9 (5%)	0	100	100
12	SW	182/184 (99%)	177 (97%)	5 (3%)	0	100	100
13	SC	90/92 (98%)	86 (96%)	4 (4%)	0	100	100
14	SX	140/142 (99%)	125 (89%)	15 (11%)	0	100	100
15	SD	119/121 (98%)	106 (89%)	12 (10%)	1 (1%)	16	50
16	SY	148/150 (99%)	138 (93%)	10 (7%)	0	100	100
17	SZ	125/127 (98%)	121 (97%)	4 (3%)	0	100	100
18	SF	139/141 (99%)	134 (96%)	5 (4%)	0	100	100
19	SG	117/125 (94%)	110 (94%)	7 (6%)	0	100	100
20	SH	143/145 (99%)	140 (98%)	3 (2%)	0	100	100
21	SI	141/143 (99%)	138 (98%)	3 (2%)	0	100	100
22	SJ	98/100 (98%)	97 (99%)	1 (1%)	0	100	100
23	Sa	85/87 (98%)	80 (94%)	5 (6%)	0	100	100
24	Sb	127/129 (98%)	120 (94%)	7 (6%)	0	100	100
25	Sc	142/144 (99%)	137 (96%)	5 (4%)	0	100	100
26	Sd	132/134 (98%)	126 (96%)	6 (4%)	0	100	100
27	Se	95/97 (98%)	94 (99%)	1 (1%)	0	100	100
28	Sf	79/81 (98%)	75 (95%)	4 (5%)	0	100	100
29	SM	51/53 (96%)	50 (98%)	1 (2%)	0	100	100
30	Sg	55/57 (96%)	46 (84%)	9 (16%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
31	SN	71/73 (97%)	61 (86%)	10 (14%)	0	100	100
32	SO	310/312 (99%)	289 (93%)	21 (7%)	0	100	100
33	SL	61/63 (97%)	58 (95%)	3 (5%)	0	100	100
34	AA	91/102 (89%)	78 (86%)	12 (13%)	1 (1%)	12	43
38	LD	249/251 (99%)	231 (93%)	18 (7%)	0	100	100
39	LE	384/386 (100%)	364 (95%)	20 (5%)	0	100	100
40	LF	359/361 (99%)	344 (96%)	15 (4%)	0	100	100
41	LG	292/294 (99%)	281 (96%)	11 (4%)	0	100	100
42	LH	163/175 (93%)	152 (93%)	11 (7%)	0	100	100
43	LI	220/222 (99%)	213 (97%)	7 (3%)	0	100	100
44	LJ	231/233 (99%)	222 (96%)	9 (4%)	0	100	100
45	LK	189/191 (99%)	181 (96%)	8 (4%)	0	100	100
46	LL	216/218 (99%)	202 (94%)	13 (6%)	1 (0%)	25	59
47	LM	167/169 (99%)	159 (95%)	8 (5%)	0	100	100
48	LN	191/193 (99%)	174 (91%)	16 (8%)	1 (0%)	25	59
49	LO	134/136 (98%)	129 (96%)	5 (4%)	0	100	100
50	LP	201/203 (99%)	189 (94%)	12 (6%)	0	100	100
51	LQ	195/197 (99%)	190 (97%)	5 (3%)	0	100	100
52	LR	181/183 (99%)	168 (93%)	13 (7%)	0	100	100
53	LS	183/185 (99%)	168 (92%)	14 (8%)	1 (0%)	25	59
54	LT	186/188 (99%)	183 (98%)	3 (2%)	0	100	100
55	LU	169/171 (99%)	158 (94%)	11 (6%)	0	100	100
56	LV	157/159 (99%)	150 (96%)	7 (4%)	0	100	100
57	LW	98/100 (98%)	86 (88%)	12 (12%)	0	100	100
58	LX	134/136 (98%)	131 (98%)	3 (2%)	0	100	100
59	LY	63/65 (97%)	59 (94%)	4 (6%)	0	100	100
60	LZ	119/121 (98%)	112 (94%)	7 (6%)	0	100	100
61	La	123/125 (98%)	122 (99%)	1 (1%)	0	100	100
62	Lb	133/135 (98%)	130 (98%)	3 (2%)	0	100	100
63	Lc	146/148 (99%)	134 (92%)	11 (8%)	1 (1%)	19	53
64	Ld	56/58 (97%)	50 (89%)	6 (11%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
65	Le	94/96 (98%)	94 (100%)	0	0	100	100
66	Lf	107/109 (98%)	102 (95%)	5 (5%)	0	100	100
67	Lg	125/127 (98%)	120 (96%)	5 (4%)	0	100	100
68	Lh	104/106 (98%)	102 (98%)	2 (2%)	0	100	100
69	Li	110/112 (98%)	107 (97%)	3 (3%)	0	100	100
70	Lj	117/119 (98%)	112 (96%)	3 (3%)	2 (2%)	7	35
71	Lk	97/99 (98%)	90 (93%)	7 (7%)	0	100	100
72	Ll	79/81 (98%)	74 (94%)	5 (6%)	0	100	100
73	Lm	75/77 (97%)	73 (97%)	2 (3%)	0	100	100
74	Ln	48/50 (96%)	47 (98%)	1 (2%)	0	100	100
75	Lo	50/52 (96%)	49 (98%)	1 (2%)	0	100	100
76	Lp	23/25 (92%)	23 (100%)	0	0	100	100
77	Lq	101/103 (98%)	93 (92%)	8 (8%)	0	100	100
78	Lr	89/91 (98%)	83 (93%)	6 (7%)	0	100	100
79	Ls	140/157 (89%)	129 (92%)	11 (8%)	0	100	100
80	z	55/588 (9%)	53 (96%)	2 (4%)	0	100	100
All	All	11120/11853 (94%)	10531 (95%)	579 (5%)	10 (0%)	50	79

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
34	AA	40	VAL
48	LN	47	ALA
15	SD	86	VAL
63	Lc	40	HIS
5	SR	174	ARG
46	LL	24	ARG
70	Lj	117	ALA
70	Lj	118	ILE
10	SU	135	ILE
53	LS	18	ALA

5.3.2 Protein sidechains ⓘ

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

entries.

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	SP	170/173 (98%)	167 (98%)	3 (2%)	54	75
3	SQ	200/205 (98%)	196 (98%)	4 (2%)	50	73
4	SE	95/98 (97%)	93 (98%)	2 (2%)	48	72
5	SR	175/175 (100%)	172 (98%)	3 (2%)	56	77
6	SA	182/182 (100%)	176 (97%)	6 (3%)	33	62
7	SS	220/220 (100%)	214 (97%)	6 (3%)	40	67
8	SB	172/173 (99%)	169 (98%)	3 (2%)	56	77
9	ST	189/195 (97%)	182 (96%)	7 (4%)	29	60
10	SU	163/165 (99%)	162 (99%)	1 (1%)	84	91
11	SV	148/149 (99%)	142 (96%)	6 (4%)	26	57
12	SW	156/157 (99%)	154 (99%)	2 (1%)	65	81
13	SC	78/85 (92%)	76 (97%)	2 (3%)	41	68
14	SX	126/127 (99%)	122 (97%)	4 (3%)	34	63
15	SD	88/98 (90%)	87 (99%)	1 (1%)	70	84
16	SY	127/127 (100%)	126 (99%)	1 (1%)	79	89
17	SZ	90/96 (94%)	85 (94%)	5 (6%)	17	49
18	SF	117/117 (100%)	109 (93%)	8 (7%)	13	42
19	SG	101/113 (89%)	98 (97%)	3 (3%)	36	64
20	SH	127/128 (99%)	124 (98%)	3 (2%)	44	69
21	SI	115/115 (100%)	109 (95%)	6 (5%)	19	50
22	SJ	93/93 (100%)	90 (97%)	3 (3%)	34	63
23	Sa	71/74 (96%)	69 (97%)	2 (3%)	38	66
24	Sb	110/110 (100%)	108 (98%)	2 (2%)	54	75
25	Sc	119/119 (100%)	113 (95%)	6 (5%)	20	52
26	Sd	102/112 (91%)	100 (98%)	2 (2%)	50	73
27	Se	82/83 (99%)	79 (96%)	3 (4%)	29	60
28	Sf	70/70 (100%)	69 (99%)	1 (1%)	62	80
29	SM	47/47 (100%)	45 (96%)	2 (4%)	25	55
30	Sg	48/49 (98%)	47 (98%)	1 (2%)	48	72

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
31	SN	56/63 (89%)	52 (93%)	4 (7%)	12	40
32	SO	250/257 (97%)	242 (97%)	8 (3%)	34	63
33	SL	55/56 (98%)	54 (98%)	1 (2%)	54	75
34	AA	76/83 (92%)	74 (97%)	2 (3%)	41	68
38	LD	190/193 (98%)	187 (98%)	3 (2%)	58	78
39	LE	321/322 (100%)	311 (97%)	10 (3%)	35	64
40	LF	288/288 (100%)	283 (98%)	5 (2%)	56	77
41	LG	241/243 (99%)	235 (98%)	6 (2%)	42	69
42	LH	139/154 (90%)	137 (99%)	2 (1%)	62	80
43	LI	186/186 (100%)	183 (98%)	3 (2%)	58	78
44	LJ	187/191 (98%)	184 (98%)	3 (2%)	58	78
45	LK	168/171 (98%)	163 (97%)	5 (3%)	36	64
46	LL	185/185 (100%)	177 (96%)	8 (4%)	25	55
47	LM	145/147 (99%)	138 (95%)	7 (5%)	21	53
48	LN	154/154 (100%)	148 (96%)	6 (4%)	27	58
49	LO	107/107 (100%)	105 (98%)	2 (2%)	52	74
50	LP	175/175 (100%)	172 (98%)	3 (2%)	56	77
51	LQ	160/160 (100%)	158 (99%)	2 (1%)	65	81
52	LR	138/145 (95%)	137 (99%)	1 (1%)	81	90
53	LS	150/150 (100%)	147 (98%)	3 (2%)	50	73
54	LT	152/153 (99%)	147 (97%)	5 (3%)	33	62
55	LU	155/155 (100%)	151 (97%)	4 (3%)	41	68
56	LV	135/136 (99%)	131 (97%)	4 (3%)	36	64
57	LW	87/87 (100%)	84 (97%)	3 (3%)	32	61
58	LX	104/104 (100%)	100 (96%)	4 (4%)	28	59
59	LY	54/57 (95%)	52 (96%)	2 (4%)	29	60
60	LZ	104/105 (99%)	104 (100%)	0	100	100
61	La	108/108 (100%)	107 (99%)	1 (1%)	75	87
62	Lb	112/115 (97%)	111 (99%)	1 (1%)	75	87
63	Lc	117/118 (99%)	113 (97%)	4 (3%)	32	61
64	Ld	46/46 (100%)	46 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
65	Le	81/81 (100%)	79 (98%)	2 (2%)	42	69
66	Lf	92/96 (96%)	87 (95%)	5 (5%)	18	50
67	Lg	108/109 (99%)	106 (98%)	2 (2%)	52	74
68	Lh	90/90 (100%)	86 (96%)	4 (4%)	24	55
69	Li	95/95 (100%)	93 (98%)	2 (2%)	48	72
70	Lj	104/104 (100%)	103 (99%)	1 (1%)	73	86
71	Lk	80/81 (99%)	76 (95%)	4 (5%)	20	52
72	Ll	67/67 (100%)	67 (100%)	0	100	100
73	Lm	68/68 (100%)	67 (98%)	1 (2%)	60	79
74	Ln	45/45 (100%)	45 (100%)	0	100	100
75	Lo	45/47 (96%)	44 (98%)	1 (2%)	47	71
76	Lp	22/23 (96%)	22 (100%)	0	100	100
77	Lq	87/88 (99%)	83 (95%)	4 (5%)	23	54
78	Lr	71/71 (100%)	70 (99%)	1 (1%)	62	80
79	Ls	118/132 (89%)	115 (98%)	3 (2%)	42	69
80	z	52/523 (10%)	51 (98%)	1 (2%)	52	74
All	All	9351/9989 (94%)	9110 (97%)	241 (3%)	42	68

All (241) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	SP	32	HIS
2	SP	78	SER
2	SP	157	ASP
3	SQ	26	ARG
3	SQ	133	TYR
3	SQ	158	SER
3	SQ	160	HIS
4	SE	92	SER
4	SE	116	LEU
5	SR	78	ASP
5	SR	162	CYS
5	SR	195	ASP
6	SA	76	ARG
6	SA	78	LYS
6	SA	129	SER

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Mol	Chain	Res	Type
6	SA	134	CYS
6	SA	154	ASP
6	SA	165	ASN
7	SS	22	LYS
7	SS	121	TYR
7	SS	153	ASN
7	SS	187	ARG
7	SS	213	SER
7	SS	226	PHE
8	SB	43	PHE
8	SB	127	GLN
8	SB	148	ARG
9	ST	19	ASP
9	ST	22	HIS
9	ST	43	ASP
9	ST	46	LYS
9	ST	115	LYS
9	ST	155	ASP
9	ST	169	TYR
10	SU	158	ASP
11	SV	18	ARG
11	SV	52	ASN
11	SV	105	ASP
11	SV	164	ARG
11	SV	168	CYS
11	SV	195	ARG
12	SW	65	LYS
12	SW	157	ASP
13	SC	13	GLN
13	SC	81	ASN
14	SX	24	LYS
14	SX	50	GLU
14	SX	67	ARG
14	SX	138	ASN
15	SD	125	ASN
16	SY	105	ASN
17	SZ	11	SER
17	SZ	61	MET
17	SZ	66	ASP
17	SZ	136	ARG
17	SZ	137	LEU
18	SF	10	PHE

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Mol	Chain	Res	Type
18	SF	26	LYS
18	SF	32	ASN
18	SF	68	ARG
18	SF	94	GLN
18	SF	102	LYS
18	SF	129	PHE
18	SF	137	ARG
19	SG	5	ARG
19	SG	35	CYS
19	SG	77	GLU
20	SH	47	CYS
20	SH	51	ASP
20	SH	64	GLU
21	SI	5	SER
21	SI	43	ASN
21	SI	108	LEU
21	SI	130	ARG
21	SI	131	ASP
21	SI	133	ASP
22	SJ	52	LYS
22	SJ	66	SER
22	SJ	90	TYR
23	Sa	21	ASN
23	Sa	76	ASP
24	Sb	3	ARG
24	Sb	94	LEU
25	Sc	18	HIS
25	Sc	61	SER
25	Sc	65	ASN
25	Sc	89	ASN
25	Sc	107	PHE
25	Sc	109	ARG
26	Sd	58	PHE
26	Sd	93	ARG
27	Se	8	ASN
27	Se	26	CYS
27	Se	68	TYR
28	Sf	33	LEU
29	SM	26	SER
29	SM	49	ASP
30	Sg	5	HIS
31	SN	106	TYR

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Mol	Chain	Res	Type
31	SN	131	PHE
31	SN	138	ARG
31	SN	145	HIS
32	SO	29	GLN
32	SO	46	LYS
32	SO	61	PHE
32	SO	109	ASP
32	SO	140	CYS
32	SO	223	TRP
32	SO	250	TYR
32	SO	316	MET
33	SL	58	GLU
34	AA	24	LYS
34	AA	47	TYR
38	LD	69	TYR
38	LD	114	SER
38	LD	149	ARG
39	LE	10	ARG
39	LE	59	ASP
39	LE	61	ASP
39	LE	110	LEU
39	LE	137	TYR
39	LE	140	ASP
39	LE	211	GLN
39	LE	319	ASN
39	LE	332	ARG
39	LE	347	SER
40	LF	93	MET
40	LF	98	ARG
40	LF	104	LYS
40	LF	120	TYR
40	LF	141	ARG
41	LG	111	GLN
41	LG	153	THR
41	LG	185	PHE
41	LG	209	GLU
41	LG	218	ARG
41	LG	248	ARG
42	LH	88	SER
42	LH	169	ASP
43	LI	75	TYR
43	LI	142	SER

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Mol	Chain	Res	Type
43	LI	183	ASP
44	LJ	83	ASP
44	LJ	147	LYS
44	LJ	173	MET
45	LK	76	ASP
45	LK	86	TYR
45	LK	92	TYR
45	LK	146	LEU
45	LK	171	ASP
46	LL	20	SER
46	LL	29	SER
46	LL	54	SER
46	LL	55	ASN
46	LL	102	MET
46	LL	123	HIS
46	LL	184	LYS
46	LL	201	SER
47	LM	25	GLU
47	LM	26	SER
47	LM	28	ASP
47	LM	62	ASN
47	LM	111	ASP
47	LM	116	TYR
47	LM	137	ARG
48	LN	31	LYS
48	LN	85	LEU
48	LN	104	ARG
48	LN	120	GLN
48	LN	162	ASN
48	LN	188	ARG
49	LO	12	TRP
49	LO	80	THR
50	LP	90	ASN
50	LP	125	SER
50	LP	138	GLN
51	LQ	117	ARG
51	LQ	189	ASP
52	LR	180	LYS
53	LS	4	ASP
53	LS	55	SER
53	LS	63	SER
54	LT	20	ARG

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Mol	Chain	Res	Type
54	LT	69	SER
54	LT	76	SER
54	LT	86	GLU
54	LT	163	ARG
55	LU	43	TYR
55	LU	81	TYR
55	LU	128	GLU
55	LU	172	TYR
56	LV	27	LEU
56	LV	56	PHE
56	LV	90	ASN
56	LV	142	SER
57	LW	13	LYS
57	LW	35	LYS
57	LW	92	TRP
58	LX	35	TYR
58	LX	45	ARG
58	LX	56	ASP
58	LX	124	ASP
59	LY	9	SER
59	LY	45	ASN
61	La	74	TYR
62	Lb	3	LYS
63	Lc	3	SER
63	Lc	60	TYR
63	Lc	77	LYS
63	Lc	88	ASP
65	Le	19	LYS
65	Le	23	TYR
66	Lf	38	LYS
66	Lf	46	THR
66	Lf	47	ASP
66	Lf	84	ASP
66	Lf	100	SER
67	Lg	81	ASP
67	Lg	126	LEU
68	Lh	18	ARG
68	Lh	19	SER
68	Lh	62	SER
68	Lh	73	ARG
69	Li	55	SER
69	Li	108	GLN

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Mol	Chain	Res	Type
70	Lj	81	ARG
71	Lk	13	LYS
71	Lk	16	LYS
71	Lk	53	TYR
71	Lk	55	ARG
73	Lm	7	ASP
75	Lo	118	THR
77	Lq	18	ARG
77	Lq	32	LYS
77	Lq	98	LYS
77	Lq	99	GLN
78	Lr	72	SER
79	Ls	44	MET
79	Ls	73	LEU
79	Ls	123	SER
80	z	399	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (56) such sidechains are listed below:

Mol	Chain	Res	Type
2	SP	69	ASN
3	SQ	124	ASN
3	SQ	149	GLN
3	SQ	177	GLN
5	SR	89	GLN
5	SR	152	HIS
7	SS	142	HIS
7	SS	157	ASN
8	SB	103	ASN
8	SB	200	ASN
9	ST	80	ASN
9	ST	201	GLN
11	SV	159	GLN
13	SC	58	GLN
14	SX	110	HIS
18	SF	93	HIS
19	SG	48	ASN
19	SG	105	GLN
20	SH	74	GLN
21	SI	129	GLN
22	SJ	33	GLN
22	SJ	36	ASN

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Mol	Chain	Res	Type
22	SJ	47	GLN
26	Sd	63	GLN
28	Sf	51	GLN
29	SM	53	ASN
32	SO	195	HIS
34	AA	82	HIS
38	LD	24	GLN
38	LD	132	ASN
39	LE	13	HIS
41	LG	57	ASN
43	LI	52	GLN
46	LL	23	ASN
46	LL	59	GLN
46	LL	112	GLN
46	LL	113	GLN
47	LM	62	ASN
48	LN	19	GLN
50	LP	87	GLN
50	LP	138	GLN
50	LP	195	ASN
51	LQ	122	GLN
52	LR	137	ASN
55	LU	63	GLN
56	LV	49	GLN
56	LV	112	ASN
64	Ld	19	ASN
65	Le	71	GLN
65	Le	75	ASN
68	Lh	24	ASN
68	Lh	26	ASN
68	Lh	106	ASN
79	Ls	79	ASN
80	z	402	GLN
80	z	403	GLN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	2	1768/1800 (98%)	447 (25%)	60 (3%)
35	A	3180/3394 (93%)	560 (17%)	38 (1%)
36	B	120/121 (99%)	13 (10%)	2 (1%)

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Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
37	C	157/158 (99%)	25 (15%)	1 (0%)
81	m	75/76 (98%)	26 (34%)	0
82	n	74/75 (98%)	18 (24%)	0
83	D	9/10 (90%)	4 (44%)	1 (11%)
All	All	5383/5634 (95%)	1093 (20%)	102 (1%)

All (1093) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	2	2	A
1	2	4	C
1	2	25	C
1	2	26	A
1	2	43	A
1	2	45	U
1	2	46	A
1	2	47	A
1	2	53	G
1	2	56	U
1	2	57	G
1	2	59	C
1	2	61	A
1	2	62	A
1	2	65	A
1	2	66	U
1	2	67	A
1	2	68	A
1	2	69	G
1	2	72	A
1	2	75	U
1	2	78	A
1	2	80	A
1	2	81	G
1	2	101	U
1	2	104	A
1	2	111	U
1	2	114	C
1	2	116	U
1	2	124	A
1	2	126	A
1	2	127	G
1	2	129	U

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Mol	Chain	Res	Type
1	2	130	C
1	2	131	C
1	2	132	U
1	2	133	U
1	2	134	U
1	2	135	A
1	2	136	C
1	2	138	A
1	2	140	A
1	2	142	G
1	2	145	A
1	2	153	G
1	2	155	U
1	2	158	U
1	2	166	C
1	2	176	C
1	2	178	U
1	2	179	A
1	2	180	A
1	2	182	A
1	2	184	C
1	2	186	C
1	2	188	A
1	2	189	C
1	2	191	C
1	2	193	U
1	2	195	G
1	2	197	A
1	2	216	U
1	2	217	A
1	2	218	A
1	2	223	U
1	2	224	C
1	2	225	A
1	2	227	U
1	2	230	C
1	2	233	C
1	2	234	G
1	2	237	C
1	2	239	C
1	2	240	U
1	2	250	C

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Mol	Chain	Res	Type
1	2	257	A
1	2	260	U
1	2	265	A
1	2	266	A
1	2	272	U
1	2	276	C
1	2	278	U
1	2	280	U
1	2	287	G
1	2	299	A
1	2	313	U
1	2	314	C
1	2	316	A
1	2	321	C
1	2	322	G
1	2	323	A
1	2	330	G
1	2	333	A
1	2	337	G
1	2	338	C
1	2	352	A
1	2	353	A
1	2	359	A
1	2	361	C
1	2	370	A
1	2	373	G
1	2	380	U
1	2	388	G
1	2	394	C
1	2	395	U
1	2	397	A
1	2	400	A
1	2	401	A
1	2	402	C
1	2	404	G
1	2	405	C
1	2	416	A
1	2	417	A
1	2	418	G
1	2	419	G
1	2	423	G
1	2	424	C

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Mol	Chain	Res	Type
1	2	425	A
1	2	426	G
1	2	434	G
1	2	435	C
1	2	437	A
1	2	439	U
1	2	444	C
1	2	445	A
1	2	446	A
1	2	447	U
1	2	448	C
1	2	460	A
1	2	461	G
1	2	468	A
1	2	484	C
1	2	485	A
1	2	487	G
1	2	489	C
1	2	491	C
1	2	492	A
1	2	494	U
1	2	496	G
1	2	498	G
1	2	500	C
1	2	501	U
1	2	502	U
1	2	506	A
1	2	507	U
1	2	510	G
1	2	515	A
1	2	517	U
1	2	518	A
1	2	538	A
1	2	539	G
1	2	540	G
1	2	541	A
1	2	542	A
1	2	554	C
1	2	555	A
1	2	556	A
1	2	557	G
1	2	558	U

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Mol	Chain	Res	Type
1	2	559	C
1	2	565	C
1	2	568	G
1	2	578	U
1	2	579	A
1	2	594	A
1	2	595	G
1	2	606	A
1	2	609	U
1	2	610	G
1	2	611	U
1	2	619	A
1	2	620	A
1	2	623	A
1	2	624	G
1	2	636	A
1	2	638	U
1	2	639	U
1	2	640	U
1	2	641	G
1	2	651	G
1	2	653	C
1	2	654	C
1	2	655	G
1	2	656	G
1	2	657	U
1	2	677	G
1	2	678	A
1	2	682	C
1	2	683	C
1	2	684	A
1	2	687	G
1	2	693	U
1	2	694	U
1	2	696	C
1	2	697	C
1	2	698	U
1	2	700	C
1	2	703	G
1	2	705	U
1	2	706	A
1	2	707	A

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Mol	Chain	Res	Type
1	2	708	C
1	2	709	C
1	2	710	U
1	2	711	U
1	2	712	G
1	2	713	A
1	2	727	U
1	2	728	U
1	2	730	G
1	2	731	C
1	2	732	G
1	2	733	A
1	2	734	A
1	2	738	G
1	2	740	A
1	2	742	U
1	2	743	U
1	2	745	U
1	2	756	A
1	2	765	G
1	2	769	A
1	2	771	A
1	2	774	A
1	2	775	G
1	2	780	A
1	2	782	U
1	2	783	G
1	2	787	G
1	2	789	A
1	2	804	A
1	2	809	A
1	2	812	A
1	2	813	U
1	2	814	A
1	2	815	G
1	2	816	G
1	2	817	A
1	2	819	G
1	2	820	U
1	2	821	U
1	2	822	U
1	2	833	U

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Mol	Chain	Res	Type
1	2	835	U
1	2	837	G
1	2	840	U
1	2	841	U
1	2	846	G
1	2	847	A
1	2	851	U
1	2	852	C
1	2	853	G
1	2	855	A
1	2	857	U
1	2	863	A
1	2	876	G
1	2	881	A
1	2	886	U
1	2	899	G
1	2	902	G
1	2	904	G
1	2	913	G
1	2	929	A
1	2	933	A
1	2	935	U
1	2	942	G
1	2	951	A
1	2	960	U
1	2	966	A
1	2	988	A
1	2	993	A
1	2	1004	U
1	2	1024	U
1	2	1025	A
1	2	1026	A
1	2	1028	C
1	2	1039	A
1	2	1053	G
1	2	1059	U
1	2	1061	A
1	2	1063	U
1	2	1066	C
1	2	1076	A
1	2	1080	U
1	2	1081	A

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Mol	Chain	Res	Type
1	2	1082	C
1	2	1092	A
1	2	1093	A
1	2	1096	C
1	2	1097	U
1	2	1100	G
1	2	1113	A
1	2	1138	A
1	2	1143	A
1	2	1158	C
1	2	1159	C
1	2	1160	A
1	2	1164	G
1	2	1167	G
1	2	1170	G
1	2	1185	U
1	2	1194	A
1	2	1196	A
1	2	1199	G
1	2	1200	G
1	2	1202	A
1	2	1214	U
1	2	1217	A
1	2	1218	G
1	2	1227	A
1	2	1229	G
1	2	1231	U
1	2	1234	A
1	2	1235	C
1	2	1241	G
1	2	1244	A
1	2	1245	G
1	2	1246	C
1	2	1252	C
1	2	1257	U
1	2	1263	G
1	2	1274	C
1	2	1275	A
1	2	1284	C
1	2	1285	U
1	2	1286	U
1	2	1301	U

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Mol	Chain	Res	Type
1	2	1307	U
1	2	1308	G
1	2	1314	U
1	2	1315	U
1	2	1318	G
1	2	1321	A
1	2	1322	A
1	2	1344	A
1	2	1345	A
1	2	1346	A
1	2	1347	U
1	2	1348	A
1	2	1349	G
1	2	1360	A
1	2	1361	U
1	2	1363	U
1	2	1370	U
1	2	1371	A
1	2	1372	U
1	2	1373	C
1	2	1381	U
1	2	1382	A
1	2	1383	G
1	2	1388	A
1	2	1390	U
1	2	1398	U
1	2	1399	C
1	2	1400	A
1	2	1402	G
1	2	1413	U
1	2	1414	U
1	2	1415	U
1	2	1427	A
1	2	1431	C
1	2	1432	U
1	2	1433	G
1	2	1436	A
1	2	1446	A
1	2	1448	G
1	2	1458	G
1	2	1459	C
1	2	1460	A

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Mol	Chain	Res	Type
1	2	1466	G
1	2	1469	A
1	2	1471	A
1	2	1472	C
1	2	1473	U
1	2	1474	G
1	2	1478	G
1	2	1490	C
1	2	1492	A
1	2	1496	U
1	2	1506	G
1	2	1514	U
1	2	1516	A
1	2	1520	U
1	2	1521	G
1	2	1523	G
1	2	1524	A
1	2	1528	U
1	2	1534	G
1	2	1536	G
1	2	1537	C
1	2	1540	G
1	2	1543	A
1	2	1545	A
1	2	1557	U
1	2	1558	U
1	2	1559	A
1	2	1569	A
1	2	1570	A
1	2	1574	G
1	2	1575	G
1	2	1576	A
1	2	1583	A
1	2	1584	G
1	2	1589	C
1	2	1590	G
1	2	1600	A
1	2	1601	G
1	2	1614	A
1	2	1634	C
1	2	1635	A
1	2	1637	C

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Mol	Chain	Res	Type
1	2	1655	A
1	2	1656	U
1	2	1657	U
1	2	1658	G
1	2	1680	G
1	2	1681	A
1	2	1688	U
1	2	1689	A
1	2	1690	G
1	2	1692	G
1	2	1693	A
1	2	1699	G
1	2	1700	C
1	2	1701	A
1	2	1709	C
1	2	1711	C
1	2	1715	G
1	2	1717	G
1	2	1731	A
1	2	1755	A
1	2	1757	G
1	2	1759	C
1	2	1760	G
1	2	1762	A
1	2	1766	A
1	2	1767	G
1	2	1769	U
1	2	1780	G
1	2	1782	A
1	2	1783	C
1	2	1792	G
1	2	1793	G
1	2	1794	A
1	2	1795	U
1	2	1796	C
1	2	1799	U
35	A	13	A
35	A	14	U
35	A	26	A
35	A	40	A
35	A	43	A
35	A	49	A

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Mol	Chain	Res	Type
35	A	59	G
35	A	60	A
35	A	65	A
35	A	66	A
35	A	73	C
35	A	77	A
35	A	92	G
35	A	99	A
35	A	110	G
35	A	111	C
35	A	116	A
35	A	117	U
35	A	121	A
35	A	122	A
35	A	135	C
35	A	136	G
35	A	150	A
35	A	156	G
35	A	157	A
35	A	166	C
35	A	173	G
35	A	176	G
35	A	187	A
35	A	190	U
35	A	191	U
35	A	200	C
35	A	210	U
35	A	211	A
35	A	213	A
35	A	218	G
35	A	219	A
35	A	239	G
35	A	241	G
35	A	242	C
35	A	243	G
35	A	247	C
35	A	249	U
35	A	250	U
35	A	251	G
35	A	252	U
35	A	253	A
35	A	257	U

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Mol	Chain	Res	Type
35	A	269	G
35	A	283	G
35	A	286	U
35	A	295	A
35	A	305	U
35	A	329	U
35	A	330	G
35	A	339	C
35	A	350	C
35	A	351	A
35	A	362	U
35	A	376	G
35	A	395	A
35	A	398	A
35	A	401	U
35	A	402	A
35	A	403	C
35	A	420	G
35	A	421	G
35	A	422	A
35	A	438	A
35	A	440	A
35	A	441	U
35	A	442	G
35	A	443	G
35	A	445	G
35	A	446	U
35	A	447	U
35	A	448	U
35	A	449	U
35	A	450	G
35	A	451	U
35	A	487	U
35	A	488	U
35	A	489	U
35	A	490	C
35	A	491	A
35	A	492	C
35	A	494	G
35	A	521	A
35	A	523	A
35	A	533	A

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Mol	Chain	Res	Type
35	A	535	G
35	A	543	C
35	A	544	C
35	A	546	C
35	A	547	G
35	A	548	G
35	A	549	U
35	A	557	A
35	A	559	A
35	A	560	G
35	A	579	G
35	A	592	A
35	A	604	G
35	A	609	G
35	A	611	A
35	A	620	U
35	A	621	A
35	A	622	A
35	A	637	C
35	A	638	C
35	A	649	A
35	A	677	A
35	A	681	U
35	A	683	U
35	A	691	A
35	A	705	A
35	A	712	G
35	A	716	A
35	A	720	A
35	A	721	G
35	A	742	G
35	A	764	U
35	A	765	C
35	A	766	U
35	A	767	U
35	A	776	U
35	A	779	G
35	A	781	G
35	A	785	G
35	A	806	A
35	A	817	A
35	A	830	A

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Mol	Chain	Res	Type
35	A	848	A
35	A	849	C
35	A	850	U
35	A	861	C
35	A	874	U
35	A	879	U
35	A	896	A
35	A	907	G
35	A	908	G
35	A	914	A
35	A	916	G
35	A	917	A
35	A	923	C
35	A	924	G
35	A	937	G
35	A	944	C
35	A	959	C
35	A	960	U
35	A	962	A
35	A	967	A
35	A	974	G
35	A	982	C
35	A	1001	G
35	A	1002	A
35	A	1010	G
35	A	1018	G
35	A	1019	G
35	A	1020	G
35	A	1024	G
35	A	1025	A
35	A	1028	U
35	A	1033	U
35	A	1036	A
35	A	1041	U
35	A	1047	A
35	A	1049	C
35	A	1063	G
35	A	1064	A
35	A	1065	A
35	A	1072	G
35	A	1081	U
35	A	1087	G

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Mol	Chain	Res	Type
35	A	1093	A
35	A	1094	U
35	A	1095	U
35	A	1097	G
35	A	1098	A
35	A	1102	A
35	A	1103	A
35	A	1104	G
35	A	1117	G
35	A	1131	G
35	A	1159	A
35	A	1160	C
35	A	1177	G
35	A	1180	A
35	A	1181	U
35	A	1192	C
35	A	1193	A
35	A	1196	C
35	A	1201	C
35	A	1209	G
35	A	1217	A
35	A	1220	U
35	A	1222	G
35	A	1223	A
35	A	1227	C
35	A	1232	C
35	A	1234	G
35	A	1235	U
35	A	1236	G
35	A	1237	G
35	A	1238	C
35	A	1239	C
35	A	1240	A
35	A	1241	U
35	A	1242	G
35	A	1243	G
35	A	1245	A
35	A	1246	G
35	A	1248	C
35	A	1249	G
35	A	1252	A
35	A	1253	U

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Mol	Chain	Res	Type
35	A	1258	U
35	A	1262	G
35	A	1263	A
35	A	1264	G
35	A	1265	U
35	A	1269	U
35	A	1270	A
35	A	1271	A
35	A	1272	C
35	A	1274	A
35	A	1278	A
35	A	1279	C
35	A	1282	G
35	A	1284	C
35	A	1287	A
35	A	1295	G
35	A	1307	G
35	A	1308	A
35	A	1309	U
35	A	1330	A
35	A	1331	U
35	A	1349	G
35	A	1352	A
35	A	1354	G
35	A	1355	A
35	A	1356	U
35	A	1357	G
35	A	1386	A
35	A	1392	G
35	A	1399	A
35	A	1400	G
35	A	1419	A
35	A	1434	G
35	A	1437	C
35	A	1446	A
35	A	1475	A
35	A	1481	A
35	A	1482	A
35	A	1483	G
35	A	1503	A
35	A	1508	C
35	A	1527	C

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Mol	Chain	Res	Type
35	A	1536	G
35	A	1549	U
35	A	1556	C
35	A	1559	A
35	A	1560	G
35	A	1563	C
35	A	1564	U
35	A	1567	U
35	A	1568	U
35	A	1569	U
35	A	1573	G
35	A	1574	C
35	A	1575	A
35	A	1576	G
35	A	1580	A
35	A	1587	A
35	A	1588	A
35	A	1589	A
35	A	1606	U
35	A	1629	U
35	A	1639	C
35	A	1642	A
35	A	1643	A
35	A	1645	U
35	A	1646	G
35	A	1657	C
35	A	1683	A
35	A	1688	U
35	A	1696	A
35	A	1717	U
35	A	1718	G
35	A	1724	U
35	A	1725	C
35	A	1741	A
35	A	1742	U
35	A	1750	A
35	A	1751	G
35	A	1762	C
35	A	1763	U
35	A	1764	U
35	A	1765	U
35	A	1766	G

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Mol	Chain	Res	Type
35	A	1770	G
35	A	1775	G
35	A	1779	C
35	A	1780	G
35	A	1797	A
35	A	1808	G
35	A	1815	U
35	A	1816	A
35	A	1817	G
35	A	1819	U
35	A	1820	U
35	A	1821	U
35	A	1839	A
35	A	1840	U
35	A	1841	A
35	A	1842	A
35	A	1845	G
35	A	1846	C
35	A	1849	C
35	A	1866	C
35	A	1867	A
35	A	1878	G
35	A	1880	U
35	A	1881	A
35	A	1906	G
35	A	1943	C
35	A	1953	G
35	A	1954	G
35	A	2101	C
35	A	2102	U
35	A	2111	G
35	A	2113	A
35	A	2121	G
35	A	2122	G
35	A	2126	A
35	A	2131	A
35	A	2140	U
35	A	2144	A
35	A	2158	A
35	A	2169	G
35	A	2206	G
35	A	2207	A

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Mol	Chain	Res	Type
35	A	2210	G
35	A	2223	A
35	A	2244	A
35	A	2246	G
35	A	2249	G
35	A	2255	A
35	A	2256	A
35	A	2272	G
35	A	2273	G
35	A	2274	U
35	A	2281	A
35	A	2282	U
35	A	2286	U
35	A	2307	G
35	A	2309	A
35	A	2310	U
35	A	2313	A
35	A	2314	U
35	A	2315	G
35	A	2318	U
35	A	2325	G
35	A	2334	U
35	A	2335	G
35	A	2336	U
35	A	2356	A
35	A	2372	A
35	A	2373	A
35	A	2374	C
35	A	2375	G
35	A	2385	G
35	A	2387	A
35	A	2388	U
35	A	2393	G
35	A	2394	G
35	A	2397	A
35	A	2402	A
35	A	2403	G
35	A	2404	A
35	A	2411	U
35	A	2412	G
35	A	2418	G
35	A	2419	A

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Mol	Chain	Res	Type
35	A	2434	U
35	A	2437	G
35	A	2438	A
35	A	2446	U
35	A	2451	G
35	A	2494	A
35	A	2496	C
35	A	2498	U
35	A	2501	U
35	A	2502	A
35	A	2503	G
35	A	2514	U
35	A	2515	A
35	A	2522	G
35	A	2526	C
35	A	2532	U
35	A	2538	U
35	A	2540	A
35	A	2541	U
35	A	2542	U
35	A	2543	U
35	A	2549	G
35	A	2552	C
35	A	2561	A
35	A	2569	A
35	A	2570	U
35	A	2571	U
35	A	2572	C
35	A	2573	G
35	A	2585	G
35	A	2593	A
35	A	2594	C
35	A	2606	G
35	A	2607	G
35	A	2614	G
35	A	2619	G
35	A	2636	A
35	A	2648	G
35	A	2652	U
35	A	2655	U
35	A	2656	A
35	A	2664	C

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Mol	Chain	Res	Type
35	A	2672	G
35	A	2674	A
35	A	2677	G
35	A	2681	U
35	A	2689	A
35	A	2691	A
35	A	2694	A
35	A	2696	A
35	A	2704	A
35	A	2713	U
35	A	2714	G
35	A	2719	U
35	A	2720	G
35	A	2728	G
35	A	2729	U
35	A	2737	C
35	A	2749	G
35	A	2753	G
35	A	2762	A
35	A	2773	C
35	A	2777	G
35	A	2778	G
35	A	2780	A
35	A	2796	G
35	A	2799	A
35	A	2800	G
35	A	2801	A
35	A	2802	A
35	A	2803	A
35	A	2810	C
35	A	2816	G
35	A	2817	A
35	A	2818	U
35	A	2842	U
35	A	2845	A
35	A	2847	A
35	A	2849	C
35	A	2867	C
35	A	2871	G
35	A	2872	A
35	A	2875	U
35	A	2876	C

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Mol	Chain	Res	Type
35	A	2887	A
35	A	2889	C
35	A	2899	C
35	A	2900	A
35	A	2923	U
35	A	2935	U
35	A	2936	A
35	A	2942	C
35	A	2947	G
35	A	2955	U
35	A	2957	G
35	A	2964	G
35	A	2971	A
35	A	2983	C
35	A	2996	U
35	A	2997	G
35	A	3012	A
35	A	3030	G
35	A	3056	U
35	A	3057	U
35	A	3059	G
35	A	3074	G
35	A	3078	U
35	A	3079	U
35	A	3086	A
35	A	3092	C
35	A	3093	C
35	A	3094	A
35	A	3101	G
35	A	3109	G
35	A	3119	U
35	A	3129	A
35	A	3130	A
35	A	3131	U
35	A	3142	A
35	A	3143	C
35	A	3153	U
35	A	3154	C
35	A	3155	U
35	A	3156	U
35	A	3157	U
35	A	3165	A

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Mol	Chain	Res	Type
35	A	3170	A
35	A	3173	G
35	A	3174	A
35	A	3176	G
35	A	3179	U
35	A	3181	C
35	A	3187	A
35	A	3196	U
35	A	3198	U
35	A	3199	G
35	A	3207	U
35	A	3210	A
35	A	3217	C
35	A	3218	A
35	A	3219	G
35	A	3222	U
35	A	3229	G
35	A	3239	G
35	A	3243	A
35	A	3245	A
35	A	3247	G
35	A	3259	U
35	A	3263	G
35	A	3270	U
35	A	3273	A
35	A	3276	G
35	A	3281	U
35	A	3287	U
35	A	3289	G
35	A	3294	A
35	A	3295	A
35	A	3304	U
35	A	3316	A
35	A	3318	G
35	A	3331	U
35	A	3334	U
35	A	3335	A
35	A	3341	U
35	A	3345	G
35	A	3351	U
35	A	3352	U
35	A	3355	U

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Mol	Chain	Res	Type
35	A	3363	U
35	A	3369	G
35	A	3375	A
35	A	3378	C
35	A	3382	U
35	A	3386	G
35	A	3389	U
35	A	3390	G
36	B	7	G
36	B	10	C
36	B	22	A
36	B	26	C
36	B	35	C
36	B	39	C
36	B	42	A
36	B	53	U
36	B	65	G
36	B	74	C
36	B	102	A
36	B	112	G
36	B	121	U
37	C	23	U
37	C	34	U
37	C	35	C
37	C	48	A
37	C	59	A
37	C	62	C
37	C	63	G
37	C	80	A
37	C	81	U
37	C	82	U
37	C	83	C
37	C	86	U
37	C	87	G
37	C	90	U
37	C	91	C
37	C	95	G
37	C	97	A
37	C	104	A
37	C	106	C
37	C	112	U
37	C	125	U

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Mol	Chain	Res	Type
37	C	126	A
37	C	138	A
37	C	148	G
37	C	152	G
81	m	2	G
81	m	8	U
81	m	9	A
81	m	14	A
81	m	16	U
81	m	18	G
81	m	19	G
81	m	21	A
81	m	46	G
81	m	48	C
81	m	49	G
81	m	50	C
81	m	51	A
81	m	52	G
81	m	53	G
81	m	55	U
81	m	57	G
81	m	58	A
81	m	59	A
81	m	60	U
81	m	61	C
81	m	62	C
81	m	66	A
81	m	68	G
81	m	69	A
81	m	74	C
82	n	9	G
82	n	11	C
82	n	14	A
82	n	16	U
82	n	19	G
82	n	21	A
82	n	22	G
82	n	29	G
82	n	44	A
82	n	46	G
82	n	47	U
82	n	48	C

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Mol	Chain	Res	Type
82	n	57	G
82	n	59	A
82	n	61	C
82	n	63	G
82	n	64	A
82	n	76	A
83	D	3	U
83	D	6	G
83	D	7	A
83	D	8	A

All (102) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	2	65	A
1	2	68	A
1	2	77	U
1	2	80	A
1	2	100	A
1	2	130	C
1	2	139	C
1	2	141	U
1	2	178	U
1	2	196	G
1	2	215	A
1	2	217	A
1	2	224	C
1	2	279	G
1	2	313	U
1	2	322	G
1	2	352	A
1	2	387	A
1	2	393	C
1	2	400	A
1	2	447	U
1	2	539	G
1	2	541	A
1	2	555	A
1	2	609	U
1	2	639	U
1	2	640	U
1	2	696	C

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Mol	Chain	Res	Type
1	2	697	C
1	2	705	U
1	2	711	U
1	2	755	A
1	2	768	C
1	2	803	A
1	2	818	C
1	2	819	G
1	2	912	U
1	2	928	U
1	2	1023	A
1	2	1226	A
1	2	1245	G
1	2	1251	U
1	2	1256	A
1	2	1273	G
1	2	1274	C
1	2	1344	A
1	2	1362	U
1	2	1382	A
1	2	1399	C
1	2	1430	U
1	2	1471	A
1	2	1535	U
1	2	1536	G
1	2	1557	U
1	2	1573	A
1	2	1588	G
1	2	1633	A
1	2	1636	C
1	2	1655	A
1	2	1688	U
35	A	13	A
35	A	186	U
35	A	241	G
35	A	282	G
35	A	637	C
35	A	719	U
35	A	763	G
35	A	849	C
35	A	873	C
35	A	916	G

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Mol	Chain	Res	Type
35	A	1064	A
35	A	1097	G
35	A	1222	G
35	A	1307	G
35	A	1348	U
35	A	1355	A
35	A	1562	C
35	A	1572	U
35	A	1815	U
35	A	1820	U
35	A	2112	U
35	A	2255	A
35	A	2495	C
35	A	2501	U
35	A	2502	A
35	A	2513	U
35	A	2514	U
35	A	2525	G
35	A	2531	C
35	A	2537	U
35	A	2541	U
35	A	3078	U
35	A	3218	A
35	A	3228	C
35	A	3269	U
35	A	3275	U
35	A	3303	G
35	A	3350	C
36	B	52	G
36	B	120	C
37	C	85	G
83	D	7	A

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

1 non-standard protein/DNA/RNA residue 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	$\#|Z| > 2$
79	5CT	Ls	51	79	13,14,15	0.72	0	8,15,17	1.76	2 (25%)

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
79	5CT	Ls	51	79	-	1/13/14/16	-

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
79	Ls	51	5CT	C4-C3-C2	-3.76	105.54	113.47
79	Ls	51	5CT	C1-NZ-CE	-2.35	108.24	113.38

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
79	Ls	51	5CT	C2-C3-C4-N1

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)

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	$\#\|Z\| > 2$
85	3HE	A	3401	-	21,21,21	0.60	0	23,30,30	0.87	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
85	3HE	A	3401	-	-	0/8/36/36	0/2/2/2

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)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
11	SV	1
82	n	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	SV	123:LYS	C	135:LYS	N	20.35
1	n	16:U	O3'	18:G	P	2.12

6 Map visualisation (i)

This section contains visualisations of the EMDB entry EMD-42525. These allow visual inspection of the internal detail of the map and identification of artifacts.

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

6.1 Orthogonal projections (i)

6.1.1 Primary map
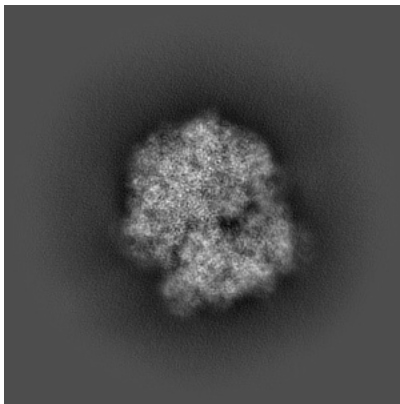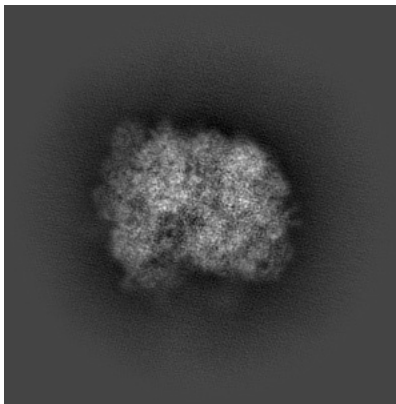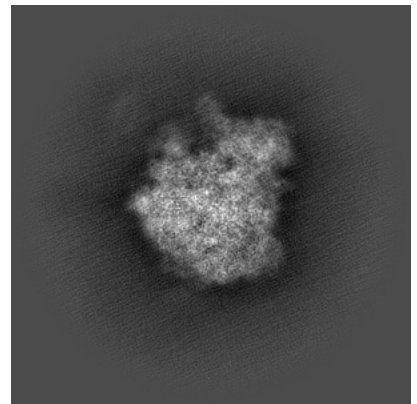
X	Y	Z

6.1.2 Raw map

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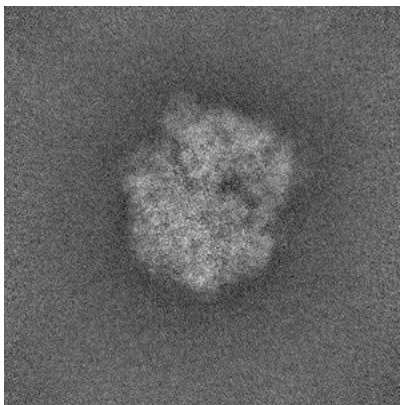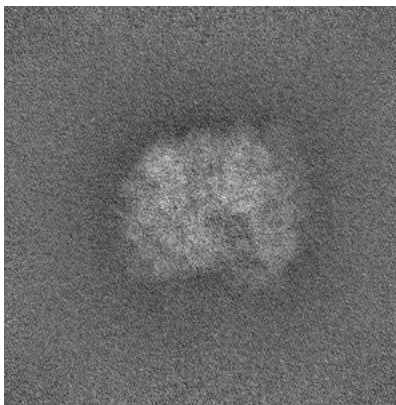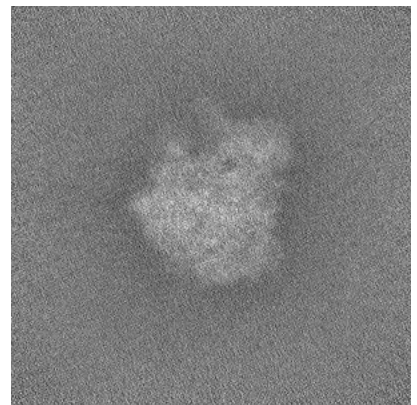
The images above show the map projected in three orthogonal directions.

6.2 Central slices ⓘ
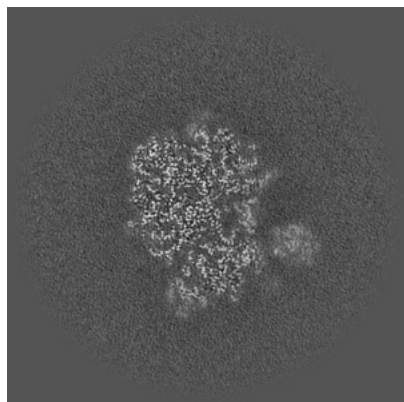
6.2.1 Primary map
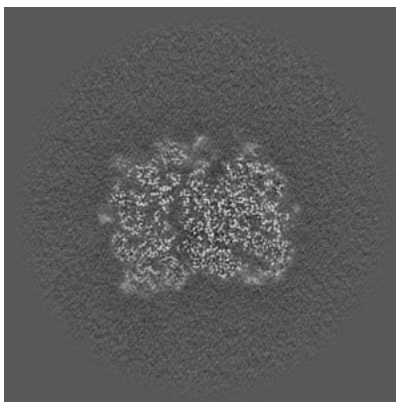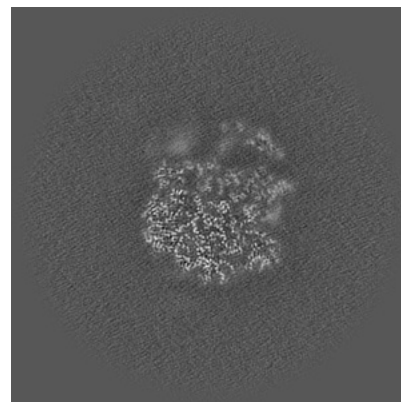
| X Index: 324 | Y Index: 324 | Z Index: 324 |

6.2.2 Raw map
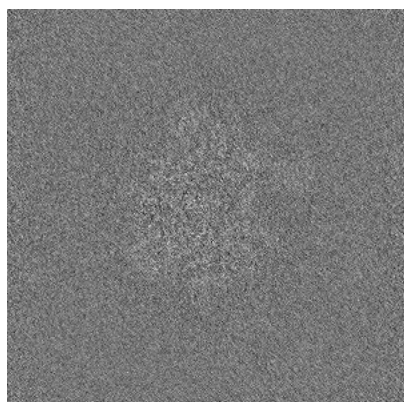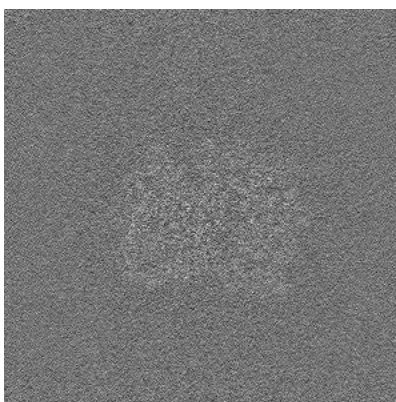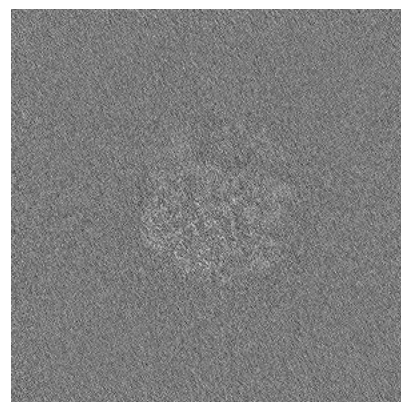
| X Index: 324 | Y Index: 324 | Z Index: 324 |

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

6.3 Largest variance slices ⓘ
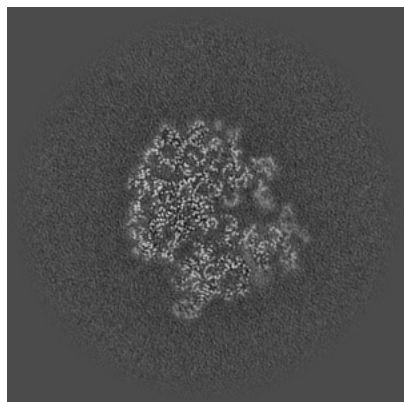
6.3.1 Primary map

X Index: 343
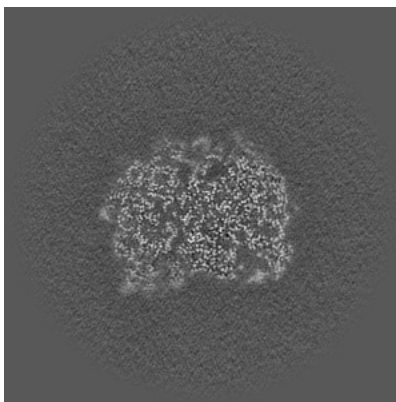
Y Index: 319
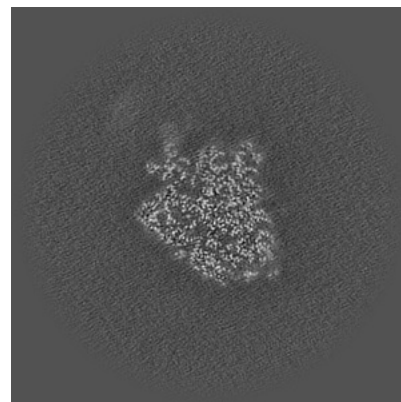
Z Index: 366

6.3.2 Raw map
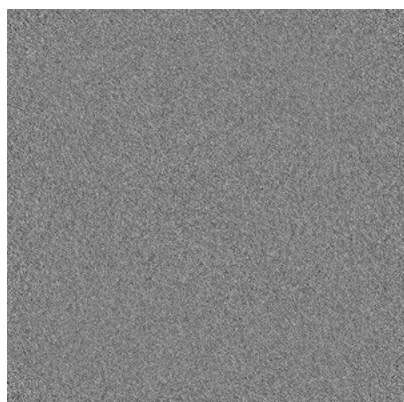
X Index: 0
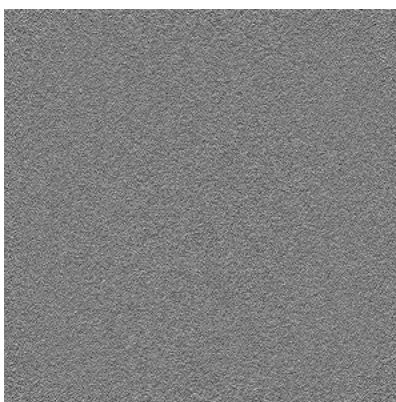
Y Index: 0
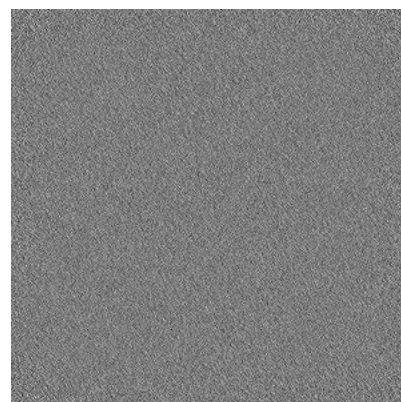
Z Index: 0

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

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

6.4.1   Primary map

| X | Y | Z |

6.4.2   Raw map

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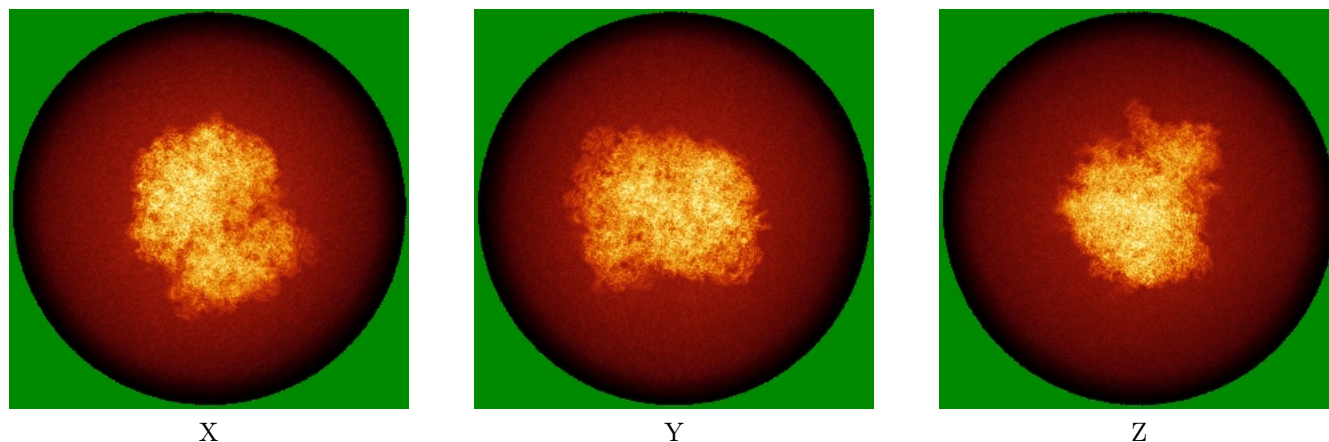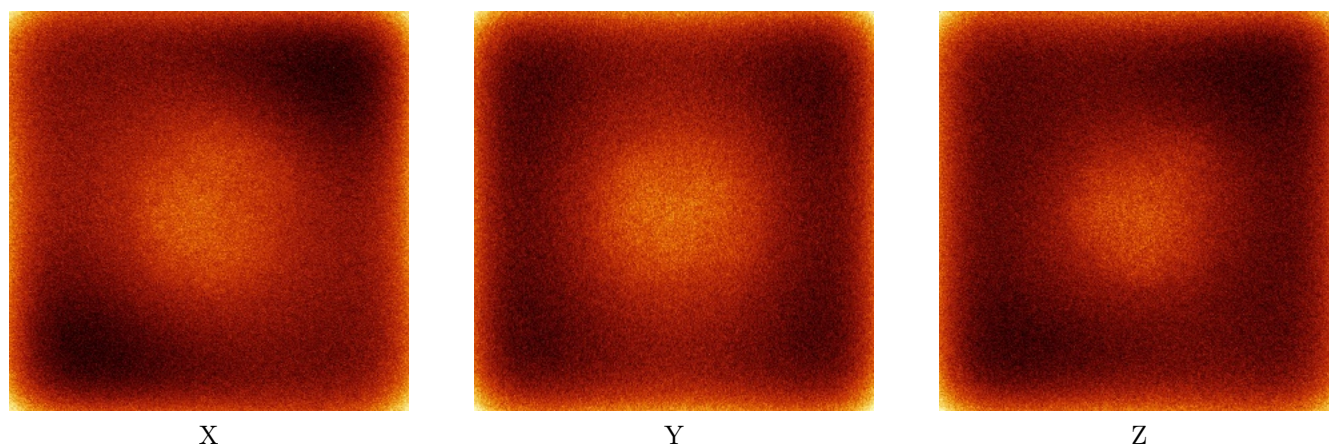
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views (i)

6.5.1 Primary map

| X | Y | Z |
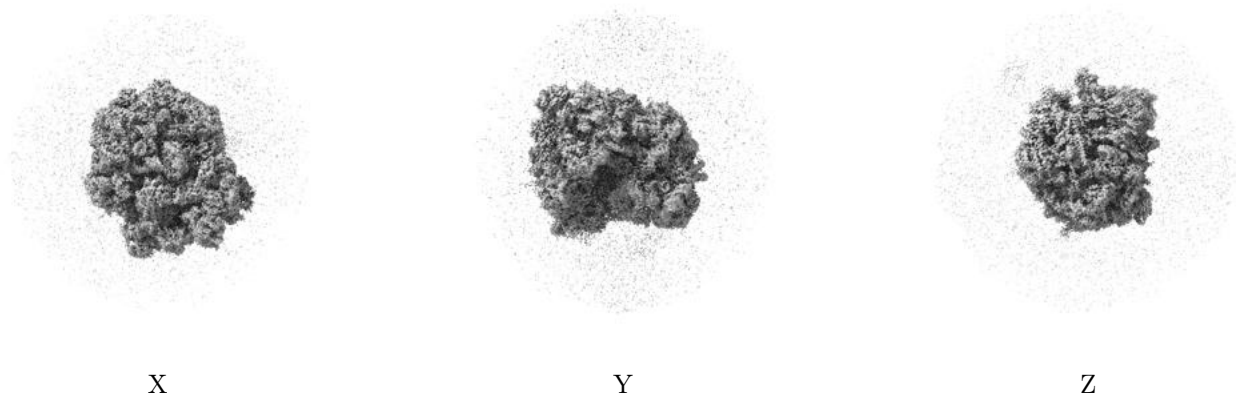
The images above show the 3D surface view of the map at the recommended contour level 0.0875. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map

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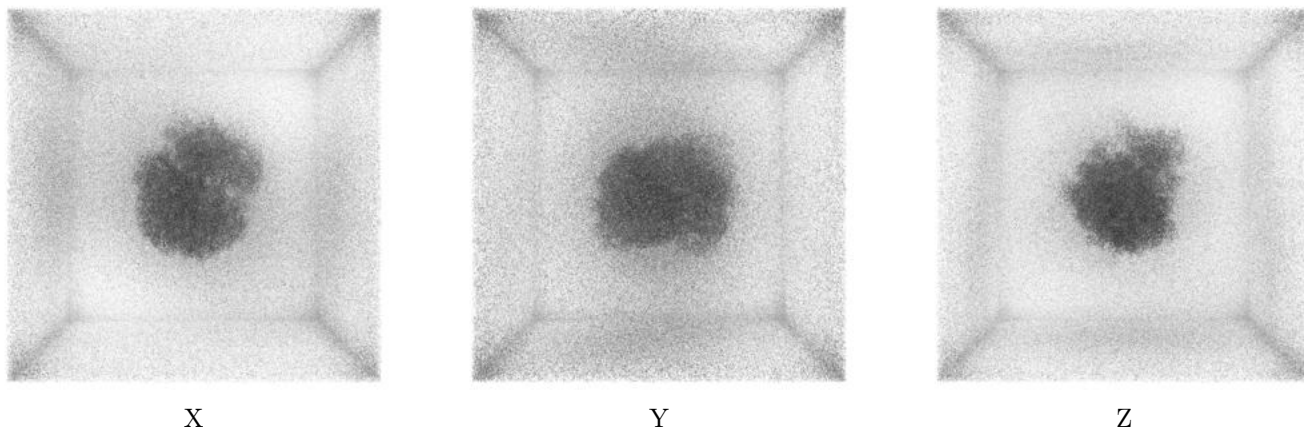
These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

6.6 Mask visualisation (i)

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

7   Map analysis ⓘ

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

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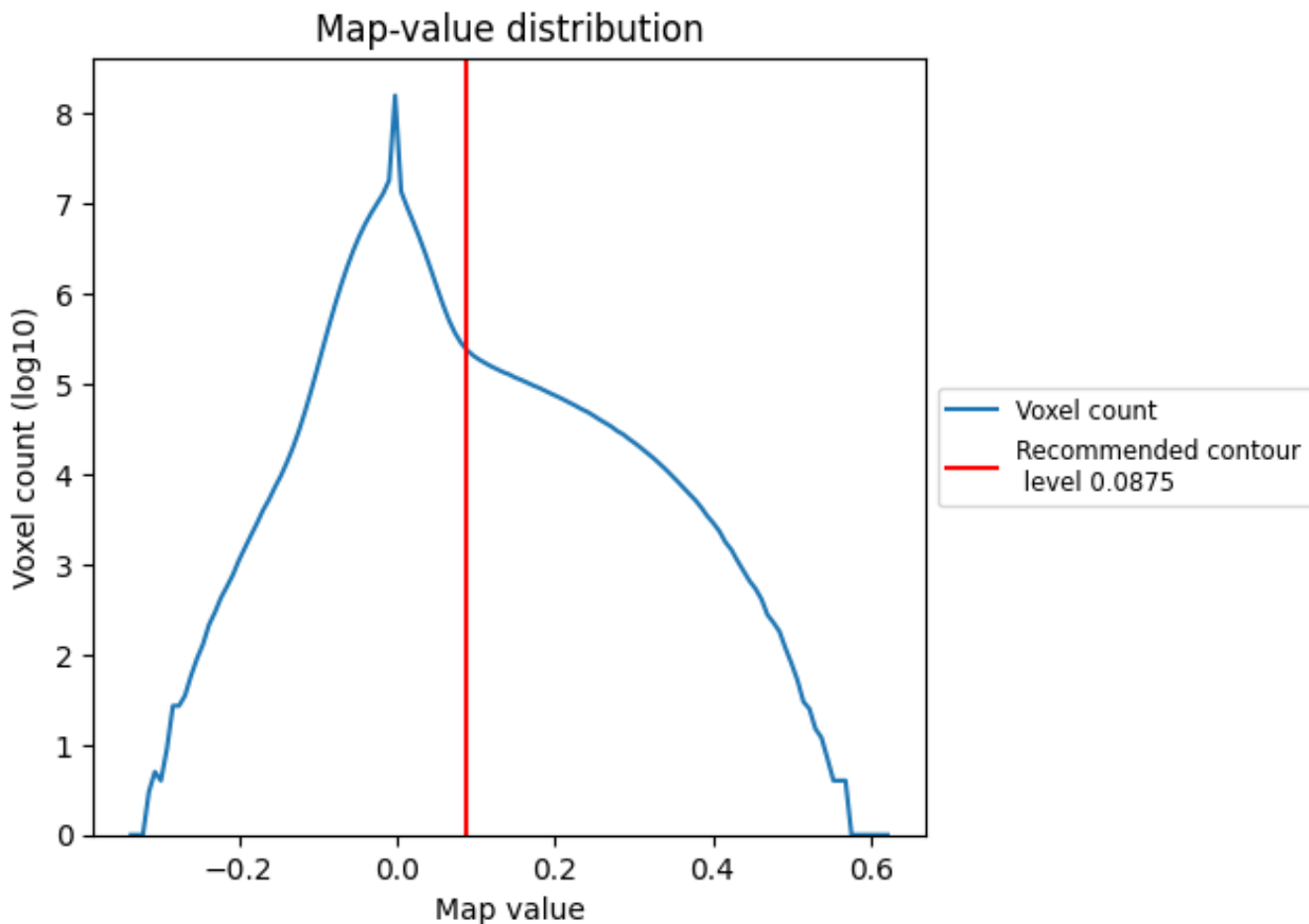
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2 Volume estimate ⓘ
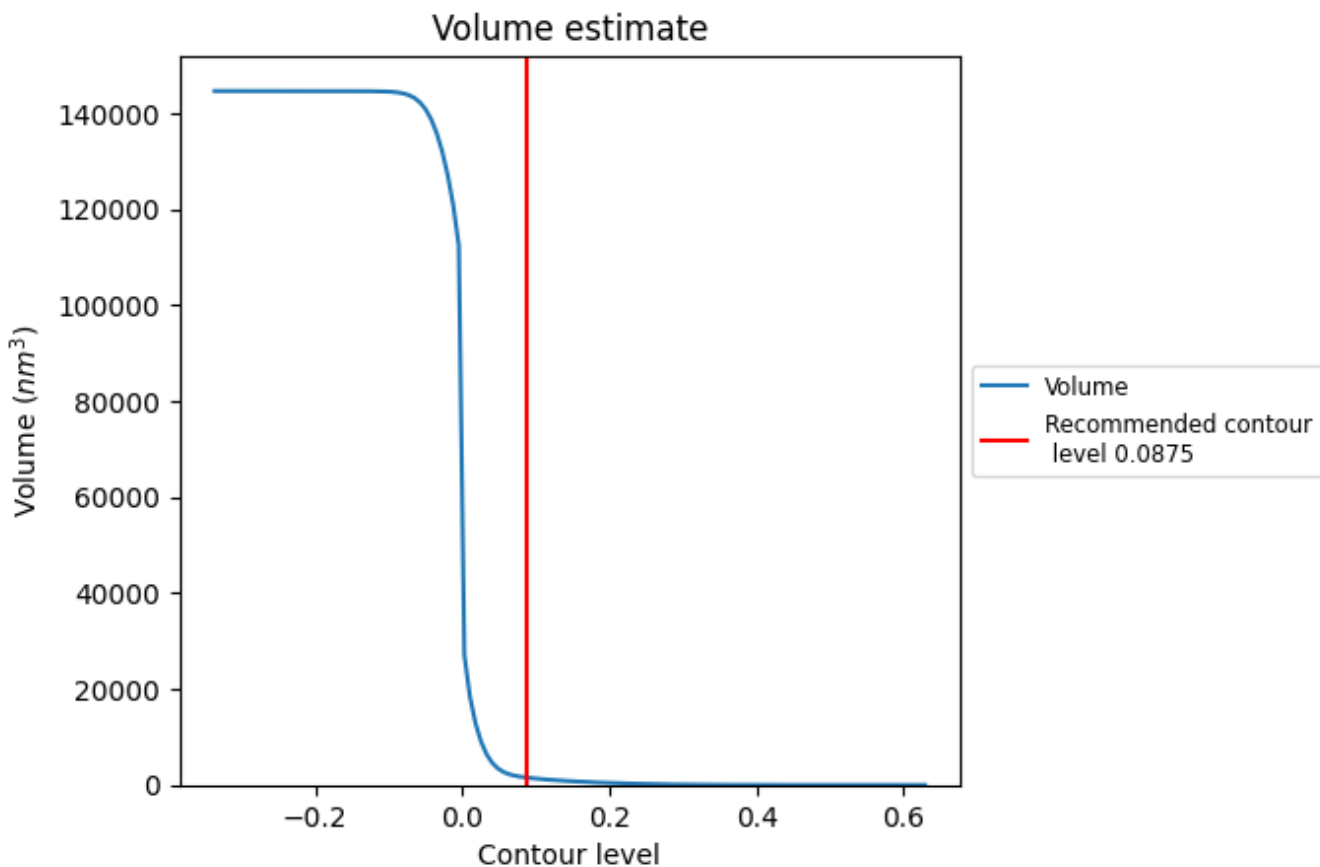
The volume at the recommended contour level is 1531 nm^3; this corresponds to an approximate mass of 1383 kDa.

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

7.3 Rotationally averaged power spectrum ⓘ
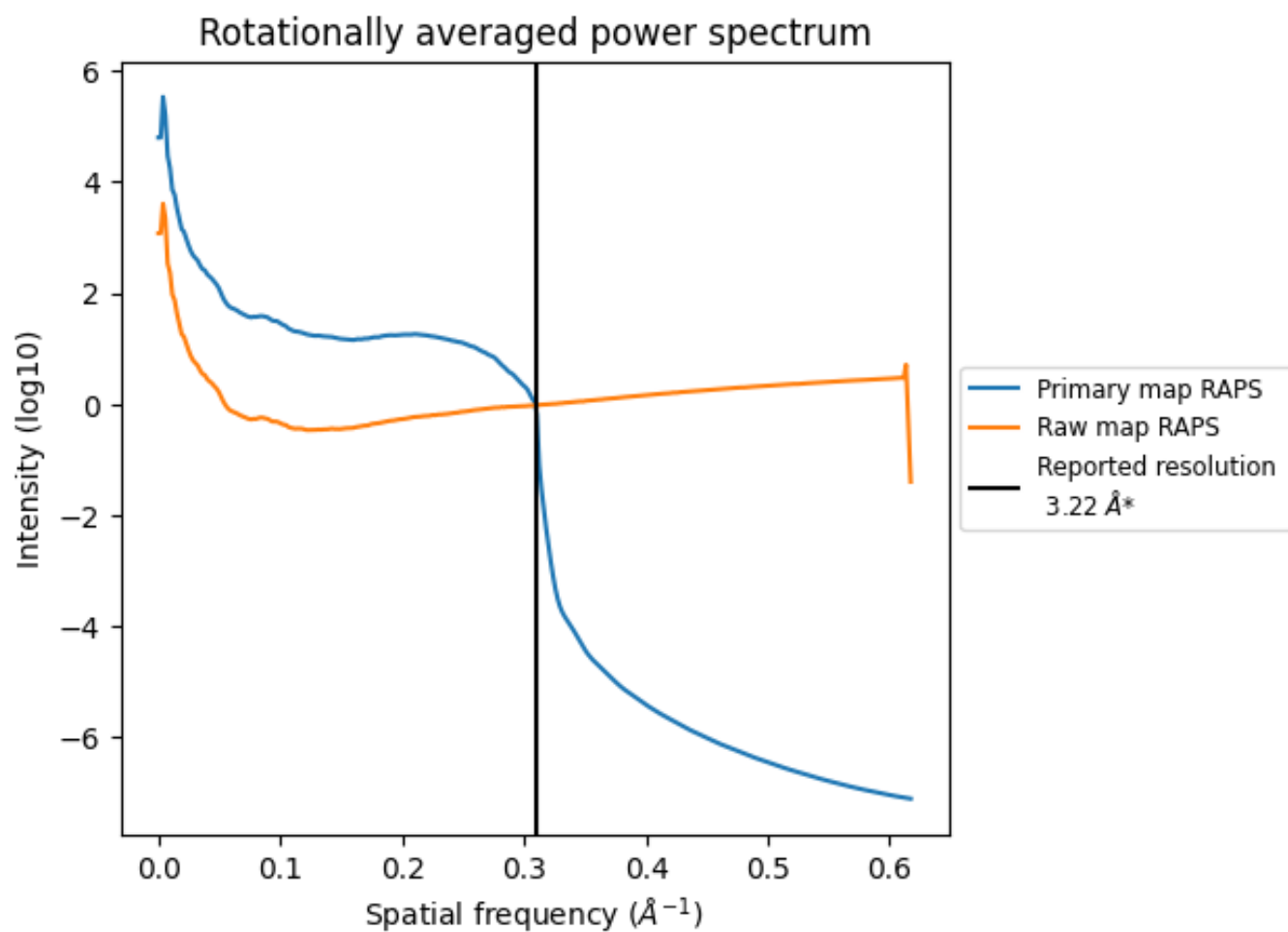
*Reported resolution corresponds to spatial frequency of 0.311 Å^{-1}

8 Fourier-Shell correlation ⓘ

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC ⓘ
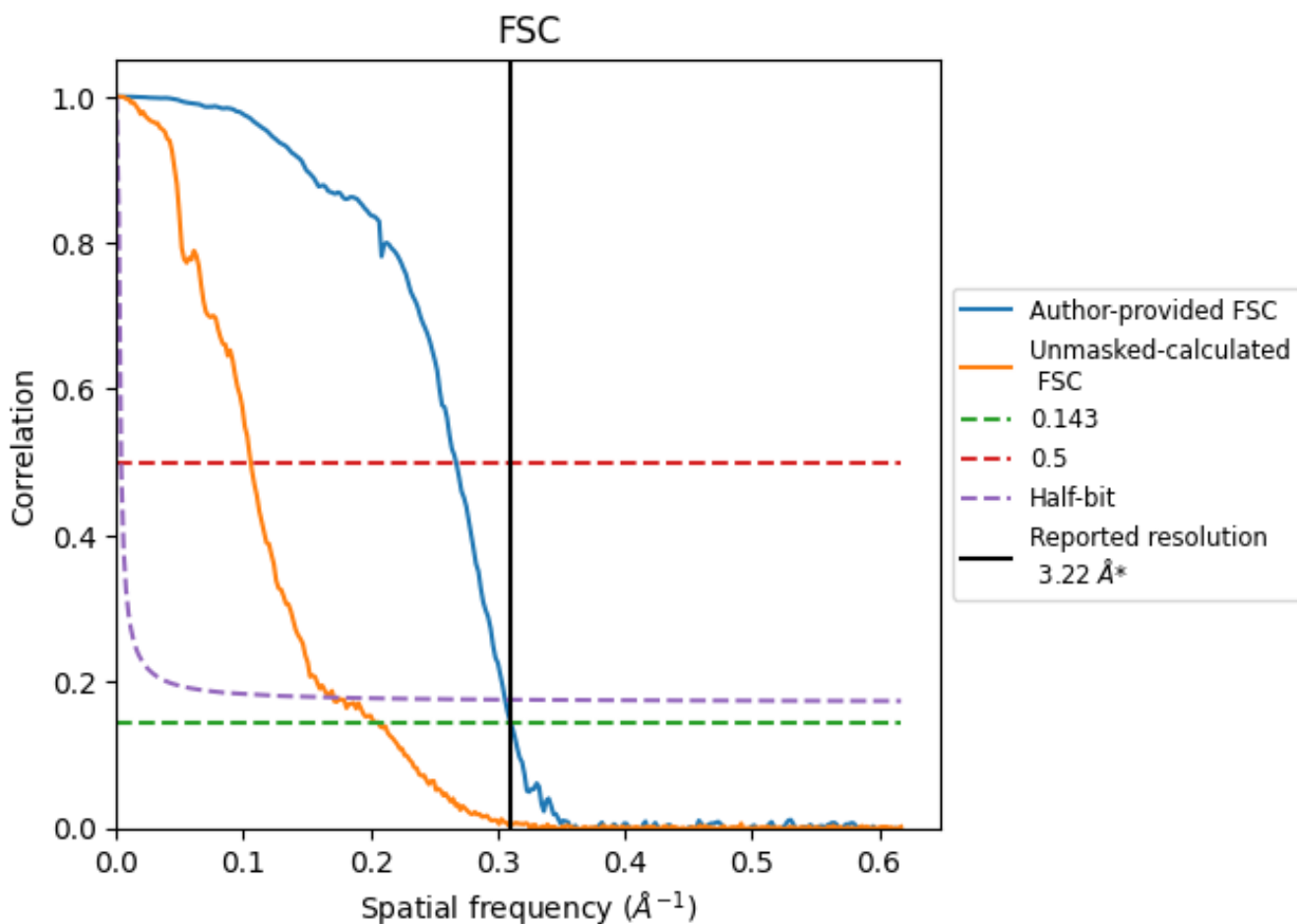
*Reported resolution corresponds to spatial frequency of 0.311 Å^{-1}

8.2 Resolution estimates (i)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.22	-	-
Author-provided FSC curve	3.22	3.74	3.27
Unmasked-calculated*	4.85	9.47	5.85

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 4.85 differs from the reported value 3.22 by more than 10 %

9　Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-42525 and PDB model 8UT0. Per-residue inclusion information can be found in section 3 on page 20.

9.1　Map-model overlay ⓘ
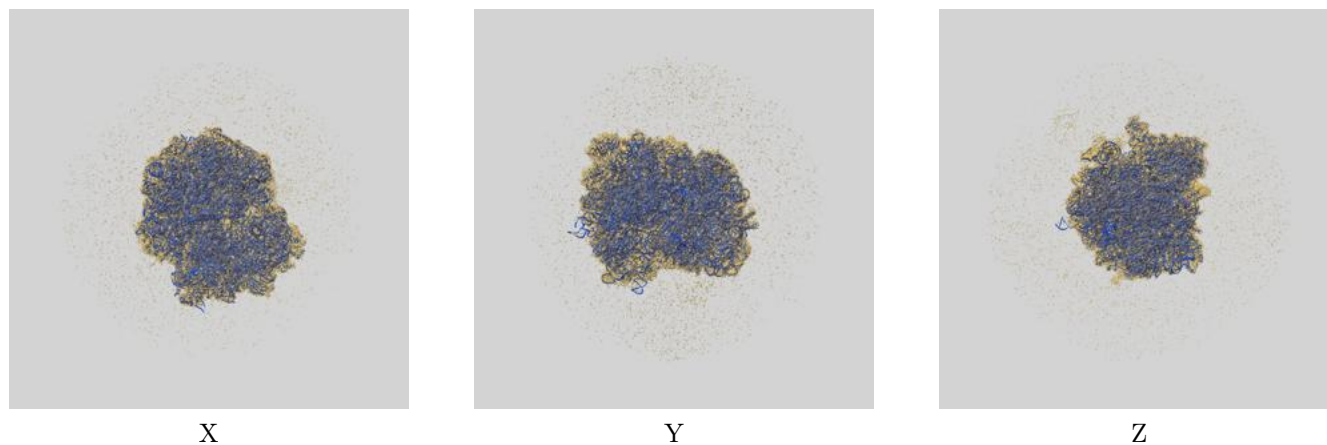
X　　　　　　　　　　　Y　　　　　　　　　　　Z

The images above show the 3D surface view of the map at the recommended contour level 0.0875 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2　Q-score mapped to coordinate model ⓘ

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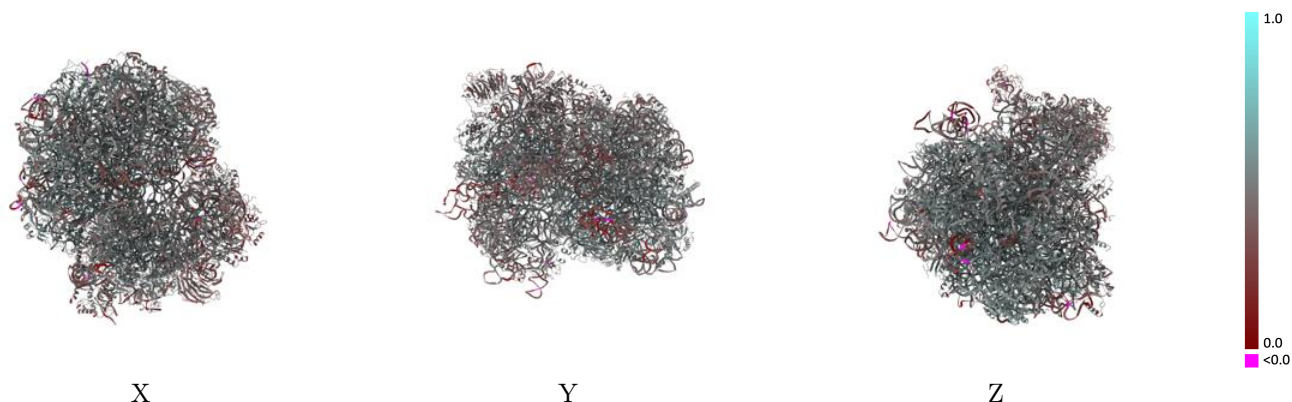
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

9.3　Atom inclusion mapped to coordinate model ⓘ

X　　　　　　　　　　　　Y　　　　　　　　　　　　Z
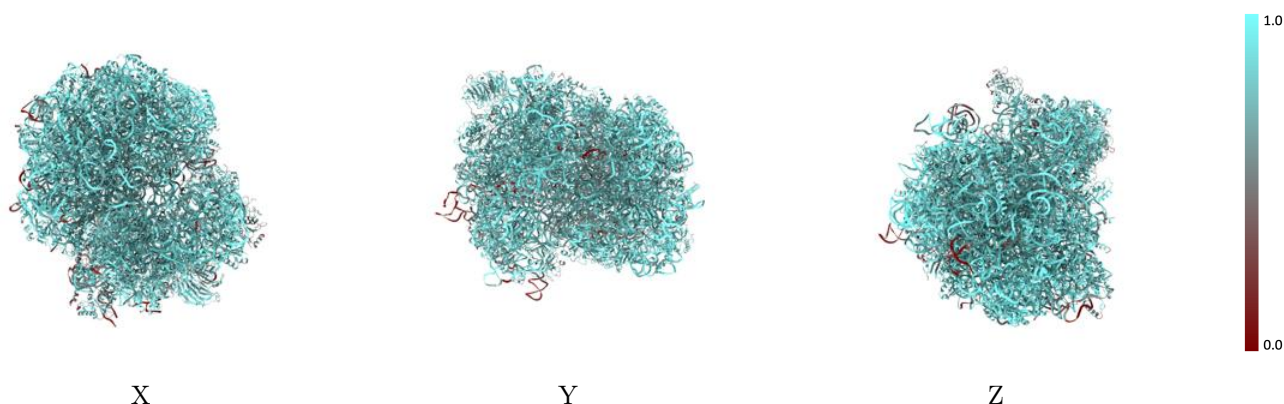
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.0875).

9.4　Atom inclusion ⓘ
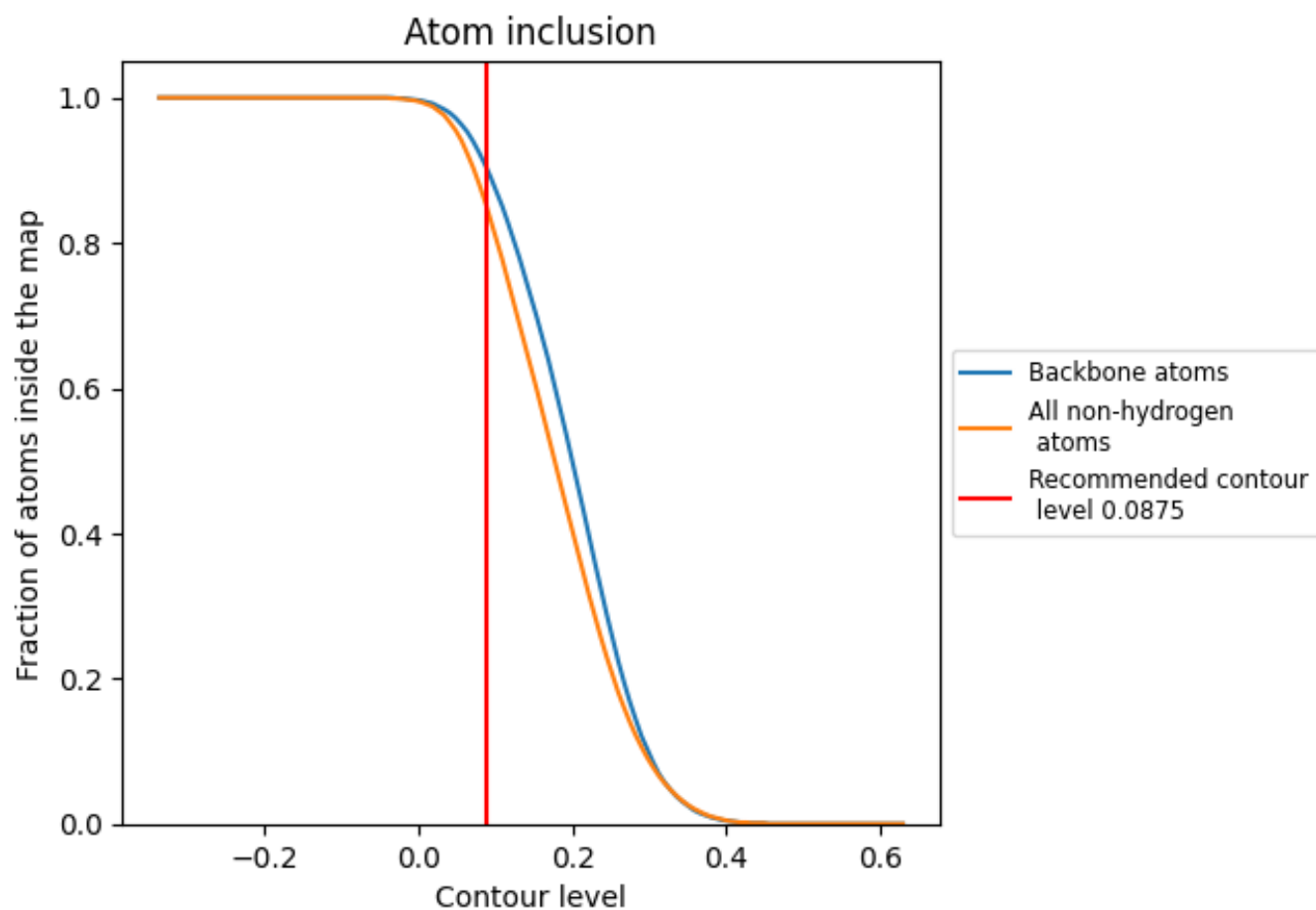
At the recommended contour level, 90% of all backbone atoms, 85% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.0875) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8530	0.4730
2	0.8450	0.4340
A	0.9010	0.4750
AA	0.6400	0.4220
B	0.9520	0.4600
C	0.9390	0.5020
D	0.9110	0.4860
E	0.8600	0.4560
LD	0.8300	0.5460
LE	0.8680	0.5260
LF	0.8760	0.5310
LG	0.8340	0.4450
LH	0.8530	0.5010
LI	0.8530	0.5110
LJ	0.8140	0.4870
LK	0.8370	0.5030
LL	0.7960	0.5050
LM	0.7770	0.4490
LN	0.8510	0.5030
LO	0.8630	0.5000
LP	0.8550	0.5350
LQ	0.8550	0.5210
LR	0.8640	0.5360
LS	0.8620	0.5150
LT	0.8190	0.5110
LU	0.8380	0.5140
LV	0.8190	0.5020
LW	0.8170	0.4740
LX	0.7760	0.5250
LY	0.8380	0.5390
LZ	0.8540	0.5340
La	0.8940	0.5420
Lb	0.8740	0.5130
Lc	0.8720	0.5170
Ld	0.7720	0.4920

1.0

0.0
<0.0

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Chain	Atom inclusion	Q-score
Le	0.8620	0.5100
Lf	0.8620	0.5190
Lg	0.8610	0.5460
Lh	0.8500	0.5440
Li	0.8310	0.5290
Lj	0.8800	0.5300
Lk	0.7920	0.4610
Ll	0.9030	0.5570
Lm	0.8280	0.5030
Ln	0.9040	0.5580
Lo	0.8310	0.5370
Lp	0.5480	0.4930
Lq	0.8100	0.4980
Lr	0.8010	0.5430
Ls	0.6590	0.4950
SA	0.7580	0.4660
SB	0.7050	0.4290
SC	0.8310	0.4390
SD	0.5530	0.2860
SE	0.7620	0.4310
SF	0.7910	0.4420
SG	0.7850	0.4390
SH	0.7890	0.4460
SI	0.8060	0.4300
SJ	0.7520	0.4340
SL	0.7150	0.4370
SM	0.8590	0.4830
SN	0.5560	0.3040
SO	0.7630	0.3940
SP	0.8380	0.4860
SQ	0.7510	0.4650
SR	0.8260	0.5180
SS	0.8140	0.4960
ST	0.7730	0.4350
SU	0.7720	0.4520
SV	0.7720	0.4740
SW	0.8180	0.4810
SX	0.8030	0.5080
SY	0.8170	0.5020
SZ	0.7740	0.4770
Sa	0.8620	0.5140
Sb	0.8440	0.5310

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Chain	Atom inclusion	Q-score
Sc	0.7810	0.5350
Sd	0.8010	0.4560
Se	0.8420	0.5050
Sf	0.8290	0.4820
Sg	0.7630	0.4830
m	0.8410	0.3990
n	0.8410	0.4460
z	0.7630	0.4980