



## Full wwPDB EM Validation Report ⓘ

Oct 8, 2022 – 09:02 pm BST

PDB ID : 7PAH  
EMDB ID : EMD-13272  
Title : 70S ribosome with P- and E-site tRNAs in Mycoplasma pneumoniae cells  
Authors : Xue, L.; Lenz, S.; Rappsilber, J.; Mahamid, J.  
Deposited on : 2021-07-30  
Resolution : 9.50 Å(reported)  
Based on initial models : 4V7C, 7OOD, 7OOC

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

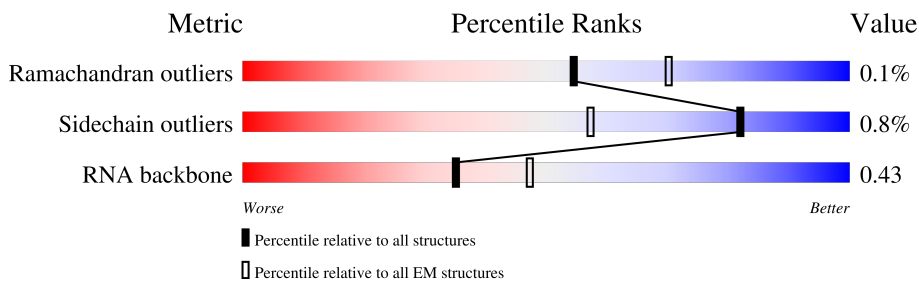
EMDB validation analysis : 0.0.1.dev43  
MolProbity : 4.02b-467  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.9  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP)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

# 1 Overall quality at a glance

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

The reported resolution of this entry is 9.50 Å.

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



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

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion  $< 40\%$ ). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	0	48	
2	1	59	
3	2	37	
4	A	294	
5	B	273	
6	C	205	
7	D	219	
8	E	215	

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Mol	Chain	Length	Quality of chain
9	F	155	20% 99%
10	G	142	23% 98%
11	H	132	21% 95%
12	I	108	28% 92% 6%
13	J	121	26% 93% 6%
14	K	139	22% 96%
15	L	124	30% 94% 5%
16	M	61	23% 98%
17	N	86	14% 97%
18	O	94	16% 85% 15%
19	P	85	34% 98%
20	Q	104	8% 62% 38%
21	R	87	39% 95%
22	S	87	5% 87% 11%
23	T	60	17% 87% 12%
24	a	287	17% 98%
25	b	287	18% 79% 20%
26	c	212	17% 98%
27	d	180	23% 97%
28	e	184	27% 95%
29	f	149	68% 96%
30	g	161	32% 72% 22%
31	h	137	55% 93% 7%
32	i	146	13% 99%
33	j	122	35% 100%

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Mol	Chain	Length	Quality of chain
34	k	151	18% 98%
35	l	139	14% 96%
36	m	124	15% 96%
37	n	116	8% 96%
38	o	119	20% 96%
39	p	127	8% 89% 10%
40	q	100	19% 98%
41	r	159	10% 87% 13%
42	s	237	8% 39% 61%
43	t	111	28% 100%
44	u	104	12% 82% 17%
45	v	65	14% 97%
46	w	111	12% 89% 10%
47	x	97	14% 45% 55%
48	y	57	14% 91% 7%
49	z	53	11% 94% 6%
50	3	2907	65% 34%
51	4	108	56% 41%
52	5	1520	69% 29%
53	7	76	5% 55% 45%
53	8	76	46% 55% 45%

## 2 Entry composition

There are 53 unique types of molecules in this entry. The entry contains 146120 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called 50S ribosomal protein L34.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	0	47	380	236	81	61	2	0	0

- Molecule 2 is a protein called 50S ribosomal protein L35.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	1	59	477	300	99	77	1	0	0

- Molecule 3 is a protein called 50S ribosomal protein L36.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	2	37	304	189	65	46	4	0	0

- Molecule 4 is a protein called 30S ribosomal protein S2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	A	240	1921	1226	334	352	9	0	0

- Molecule 5 is a protein called 30S ribosomal protein S3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	B	215	1698	1073	313	307	5	0	0

- Molecule 6 is a protein called 30S ribosomal protein S4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	C	203	1660	1051	314	290	5	0	0

- Molecule 7 is a protein called 30S ribosomal protein S5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	D	153	1173	742	226	202	3	0	0

- Molecule 8 is a protein called 30S ribosomal protein S6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
8	E	167	1362	857	240	263	2	0	0

- Molecule 9 is a protein called 30S ribosomal protein S7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	F	154	1246	785	239	216	6	0	0

- Molecule 10 is a protein called 30S ribosomal protein S8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
10	G	141	1110	723	193	192	2	0	0

- Molecule 11 is a protein called 30S ribosomal protein S9.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
11	H	128	1028	655	191	181	1	0	0

- Molecule 12 is a protein called 30S ribosomal protein S10.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
12	I	101	809	523	142	143	1	0	0

- Molecule 13 is a protein called 30S ribosomal protein S11.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
13	J	114	829	514	153	156	6	0	0

- Molecule 14 is a protein called 30S ribosomal protein S12.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
14	K	136	1076	680	213	181	2	0	0

- Molecule 15 is a protein called 30S ribosomal protein S13.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
15	L	118	951	594	191	166		0	0

- Molecule 16 is a protein called 30S ribosomal protein S14 type Z.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
16	M	60	474	302	96	72	4	0	0

- Molecule 17 is a protein called 30S ribosomal protein S15.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
17	N	83	673	428	125	120		0	0

- Molecule 18 is a protein called 30S ribosomal protein S16.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
18	O	80	646	414	119	111	2	0	0

- Molecule 19 is a protein called 30S ribosomal protein S17.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
19	P	83	675	425	135	115		0	0

- Molecule 20 is a protein called 30S ribosomal protein S18.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
20	Q	65	535	342	103	86	4	0	0

- Molecule 21 is a protein called 30S ribosomal protein S19.

Mol	Chain	Residues	Atoms					AltConf	Trace
21	R	84	Total	C	N	O	S	0	0
			682	435	127	118	2		

- Molecule 22 is a protein called 30S ribosomal protein S20.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	S	77	Total	C	N	O	S	0	0
			629	383	135	111			

- Molecule 23 is a protein called 30S ribosomal protein S21.

Mol	Chain	Residues	Atoms					AltConf	Trace
23	T	53	Total	C	N	O	S	0	0
			471	295	103	72	1		

- Molecule 24 is a protein called 50S ribosomal protein L2.

Mol	Chain	Residues	Atoms					AltConf	Trace
24	a	285	Total	C	N	O	S	0	0
			2225	1385	437	397	6		

- Molecule 25 is a protein called 50S ribosomal protein L3.

Mol	Chain	Residues	Atoms					AltConf	Trace
25	b	229	Total	C	N	O	S	0	0
			1762	1119	318	318	7		

- Molecule 26 is a protein called 50S ribosomal protein L4.

Mol	Chain	Residues	Atoms					AltConf	Trace
26	c	210	Total	C	N	O	S	0	0
			1644	1047	297	297	3		

- Molecule 27 is a protein called 50S ribosomal protein L5.

Mol	Chain	Residues	Atoms					AltConf	Trace
27	d	175	Total	C	N	O	S	0	0
			1388	893	245	246	4		

- Molecule 28 is a protein called 50S ribosomal protein L6.



Mol	Chain	Residues	Atoms				AltConf	Trace
28	e	176	Total	C	N	O	0	0
			1396	899	247	250		

- Molecule 29 is a protein called 50S ribosomal protein L9.

Mol	Chain	Residues	Atoms					AltConf	Trace
29	f	145	Total	C	N	O	S	0	0
			1160	746	204	207	3		

- Molecule 30 is a protein called 50S ribosomal protein L10.

Mol	Chain	Residues	Atoms					AltConf	Trace
30	g	126	Total	C	N	O	S	0	0
			960	612	167	178	3		

- Molecule 31 is a protein called 50S ribosomal protein L11.

Mol	Chain	Residues	Atoms					AltConf	Trace
31	h	128	Total	C	N	O	S	0	0
			959	616	160	177	6		

- Molecule 32 is a protein called 50S ribosomal protein L13.

Mol	Chain	Residues	Atoms					AltConf	Trace
32	i	144	Total	C	N	O	S	0	0
			1164	737	213	209	5		

- Molecule 33 is a protein called 50S ribosomal protein L14.

Mol	Chain	Residues	Atoms					AltConf	Trace
33	j	122	Total	C	N	O	S	0	0
			944	595	178	167	4		

- Molecule 34 is a protein called 50S ribosomal protein L15.

Mol	Chain	Residues	Atoms				AltConf	Trace
34	k	148	Total	C	N	O	0	0
			1153	731	226	196		

- Molecule 35 is a protein called 50S ribosomal protein L16.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
35	l	136	1079	694	196	182	7	0	0

- Molecule 36 is a protein called 50S ribosomal protein L17.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
36	m	119	958	609	175	171	3	0	0

- Molecule 37 is a protein called 50S ribosomal protein L18.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
37	n	112	889	557	175	155	2	0	0

- Molecule 38 is a protein called 50S ribosomal protein L19.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
38	o	115	938	592	180	165	1	0	0

- Molecule 39 is a protein called 50S ribosomal protein L20.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
39	p	114	947	603	188	154	2	0	0

- Molecule 40 is a protein called 50S ribosomal protein L21.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
40	q	99	811	525	148	134	4	0	0

- Molecule 41 is a protein called 50S ribosomal protein L22.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
41	r	139	1068	663	207	191	7	0	0

- Molecule 42 is a protein called 50S ribosomal protein L23.

Mol	Chain	Residues	Atoms					AltConf	Trace
42	s	92	Total	C	N	O	S	0	0
			720	475	122	122	1		

- Molecule 43 is a protein called 50S ribosomal protein L24.

Mol	Chain	Residues	Atoms					AltConf	Trace
43	t	111	Total	C	N	O	S	0	0
			872	550	166	153	3		

- Molecule 44 is a protein called 50S ribosomal protein L27.

Mol	Chain	Residues	Atoms					AltConf	Trace
44	u	86	Total	C	N	O	S	0	0
			657	409	130	117	1		

- Molecule 45 is a protein called 50S ribosomal protein L28.

Mol	Chain	Residues	Atoms					AltConf	Trace
45	v	63	Total	C	N	O	S	0	0
			513	317	108	87	1		

- Molecule 46 is a protein called 50S ribosomal protein L29.

Mol	Chain	Residues	Atoms				AltConf	Trace
46	w	100	Total	C	N	O	0	0
			818	517	153	148		

- Molecule 47 is a protein called 50S ribosomal protein L31.

Mol	Chain	Residues	Atoms					AltConf	Trace
47	x	44	Total	C	N	O	S	0	0
			344	221	55	64	4		

- Molecule 48 is a protein called 50S ribosomal protein L32.

Mol	Chain	Residues	Atoms					AltConf	Trace
48	y	56	Total	C	N	O	S	0	0
			452	274	98	75	5		

- Molecule 49 is a protein called 50S ribosomal protein L33 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
49	z	50	Total	C	N	O	S	0	0
			408	255	81	68	4		

- Molecule 50 is a RNA chain called 23S ribosomal RNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
50	3	2878	Total	C	N	O	P	0	0
			61664	27558	11236	19995	2875		

- Molecule 51 is a RNA chain called 5S ribosomal RNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
51	4	105	Total	C	N	O	P	0	0
			2239	1003	409	724	103		

- Molecule 52 is a RNA chain called 16S ribosomal RNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
52	5	1493	Total	C	N	O	P	0	0
			31943	14279	5792	10382	1490		

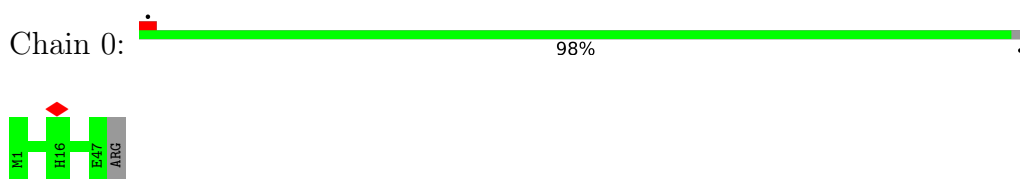
- Molecule 53 is a RNA chain called tRNA-Phe.

Mol	Chain	Residues	Atoms					AltConf	Trace
53	7	76	Total	C	N	O	P	0	0
			1618	723	289	531	75		
53	8	76	Total	C	N	O	P	0	0
			1618	723	289	531	75		

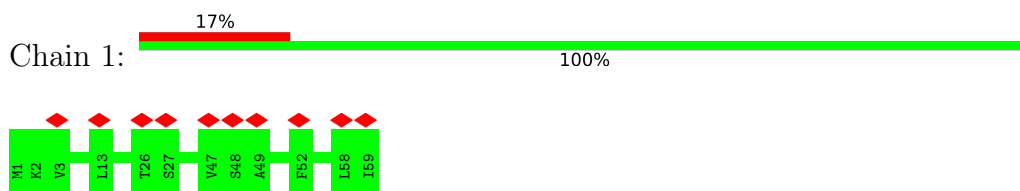
### 3 Residue-property plots

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.

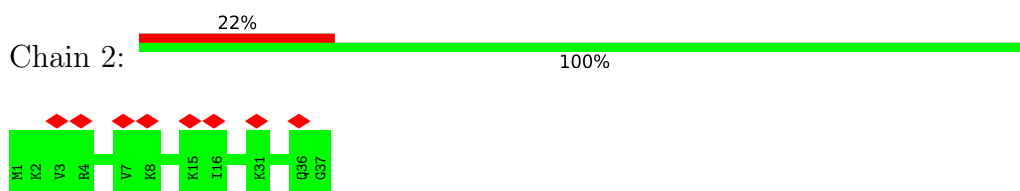
- Molecule 1: 50S ribosomal protein L34



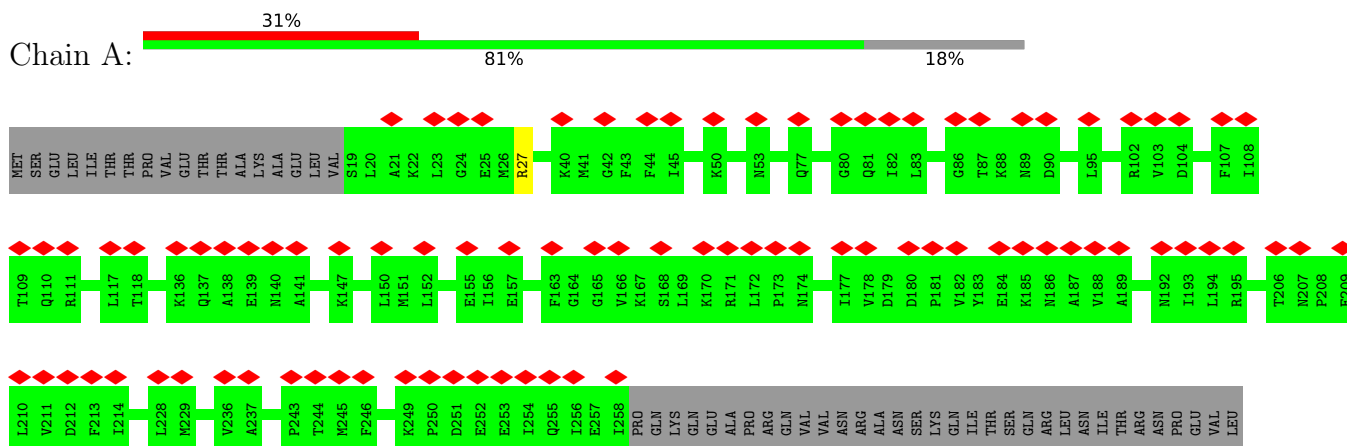
- Molecule 2: 50S ribosomal protein L35



- Molecule 3: 50S ribosomal protein L36

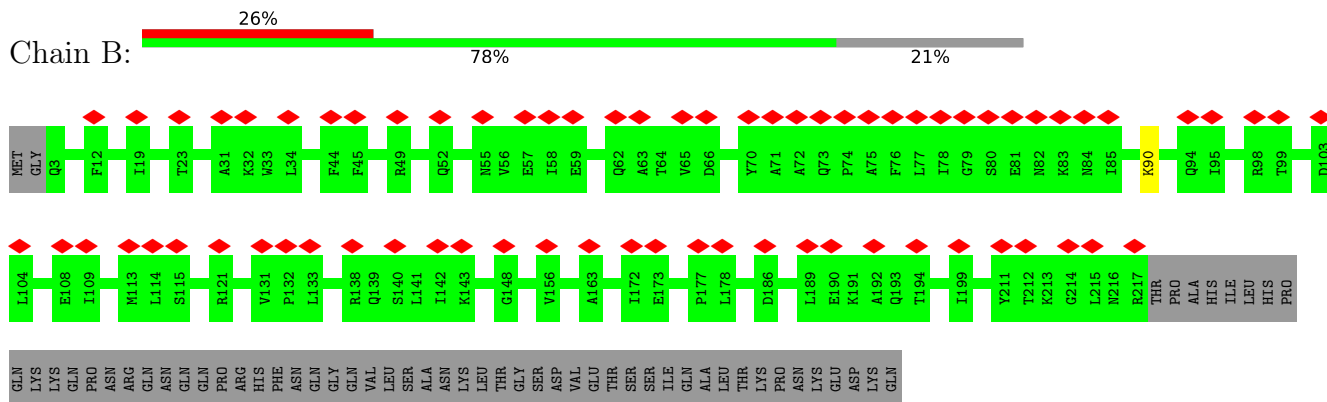


- Molecule 4: 30S ribosomal protein S2

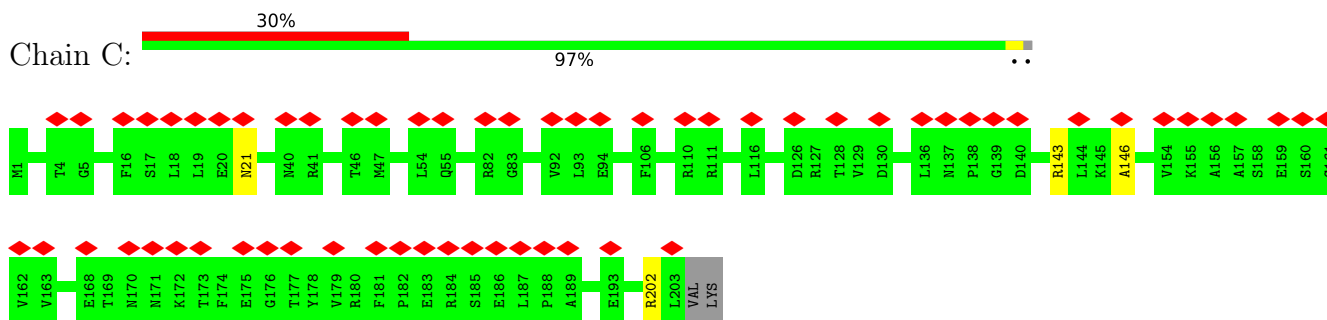


THR  
ARG  
GLU

• Molecule 5: 30S ribosomal protein S3



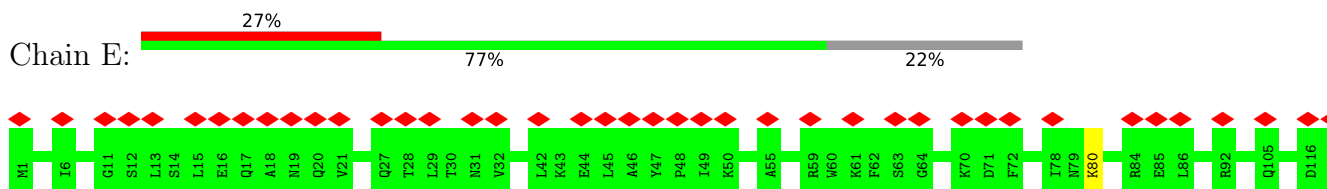
• Molecule 6: 30S ribosomal protein S4

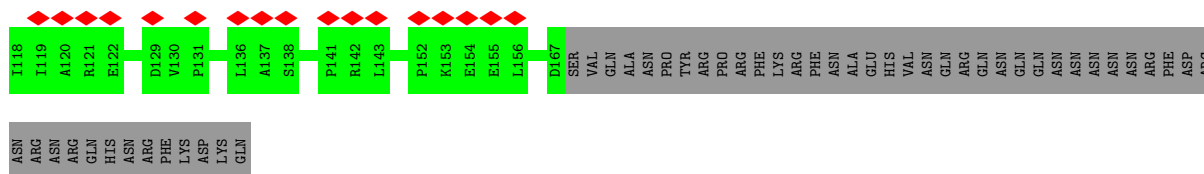


• Molecule 7: 30S ribosomal protein S5

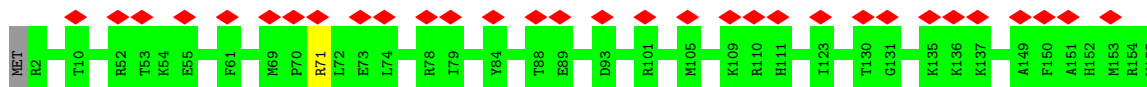


• Molecule 8: 30S ribosomal protein S6

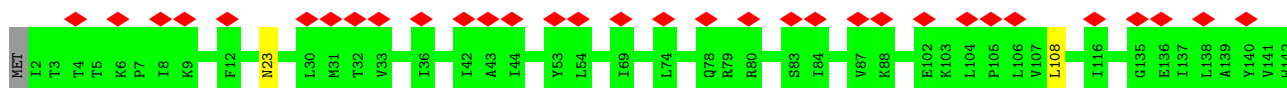




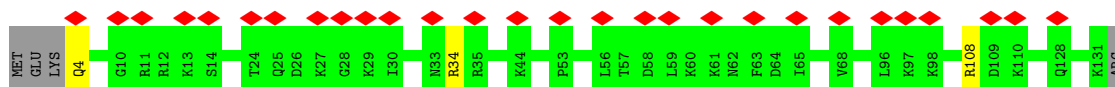
- Molecule 9: 30S ribosomal protein S7



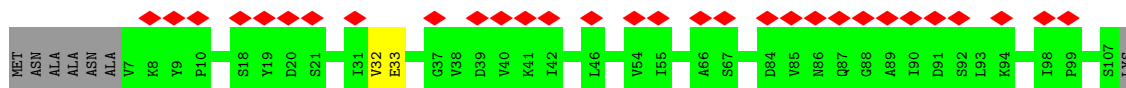
- Molecule 10: 30S ribosomal protein S8



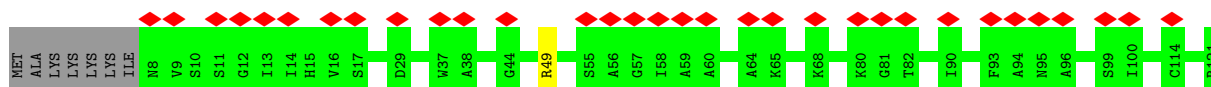
- Molecule 11: 30S ribosomal protein S9



- Molecule 12: 30S ribosomal protein S10

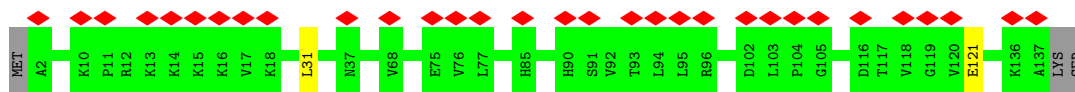


- Molecule 13: 30S ribosomal protein S11

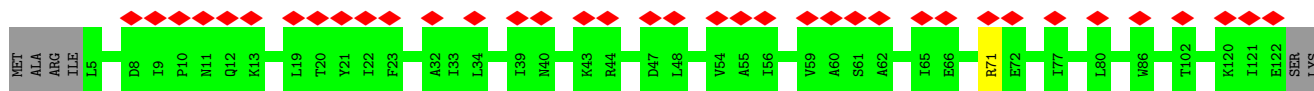
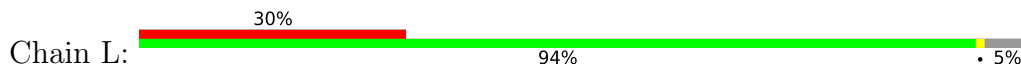


- Molecule 14: 30S ribosomal protein S12

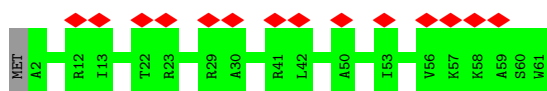




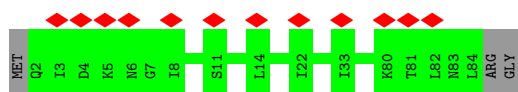
• Molecule 15: 30S ribosomal protein S13



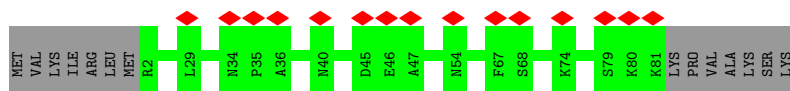
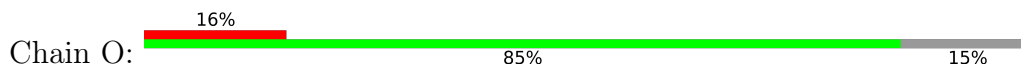
• Molecule 16: 30S ribosomal protein S14 type Z



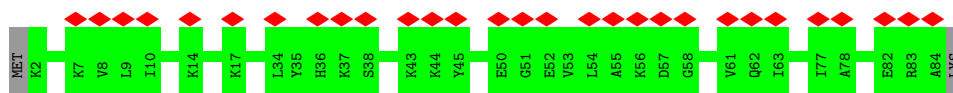
• Molecule 17: 30S ribosomal protein S15



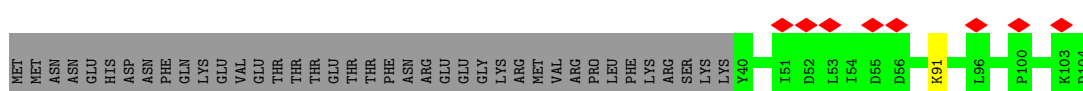
• Molecule 18: 30S ribosomal protein S16



• Molecule 19: 30S ribosomal protein S17

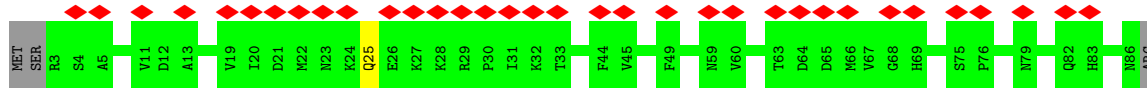


• Molecule 20: 30S ribosomal protein S18

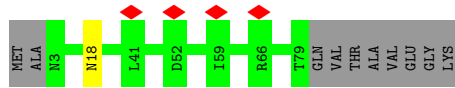
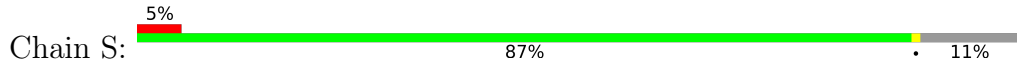


• Molecule 21: 30S ribosomal protein S19

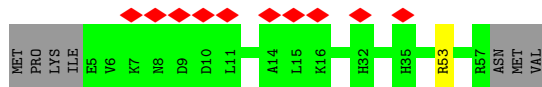
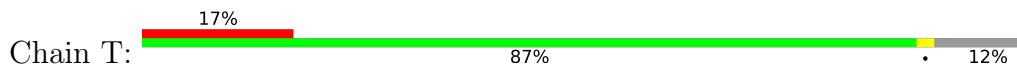




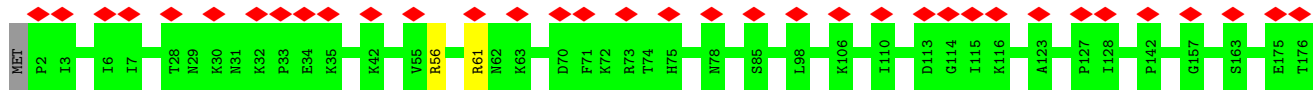
• Molecule 22: 30S ribosomal protein S20



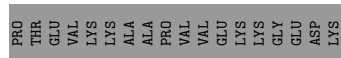
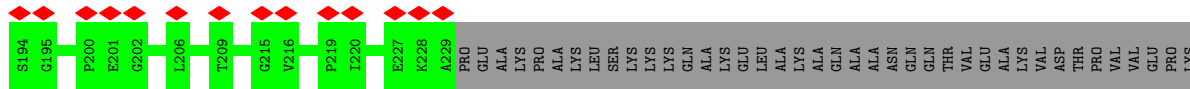
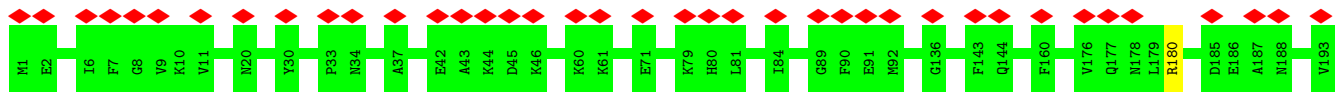
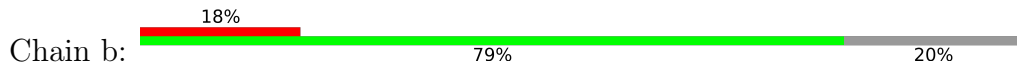
• Molecule 23: 30S ribosomal protein S21



• Molecule 24: 50S ribosomal protein L2

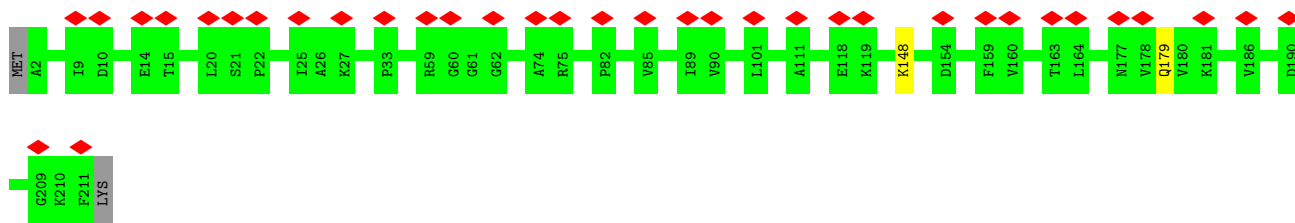


• Molecule 25: 50S ribosomal protein L3

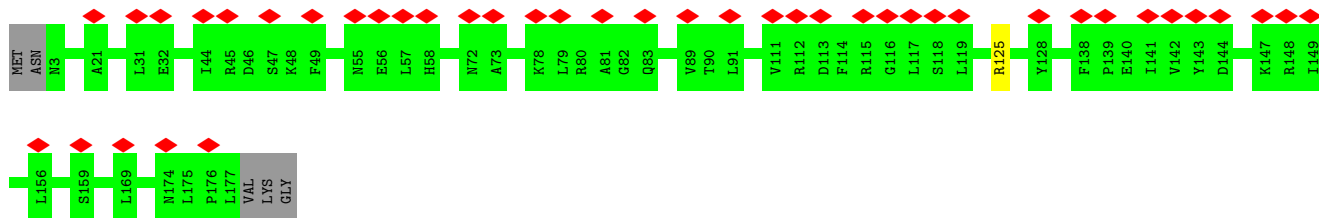


• Molecule 26: 50S ribosomal protein L4

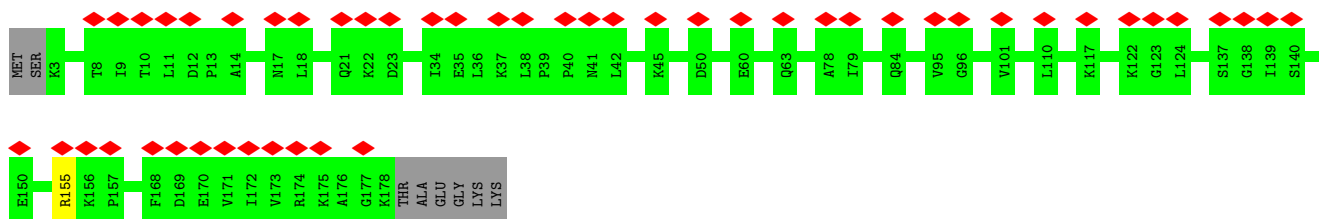




• Molecule 27: 50S ribosomal protein L5



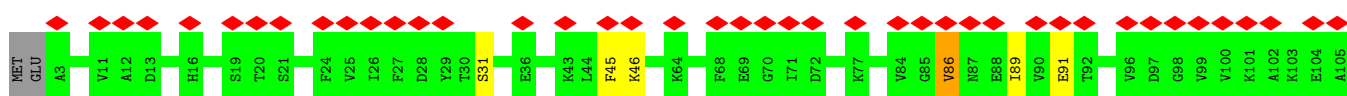
• Molecule 28: 50S ribosomal protein L6

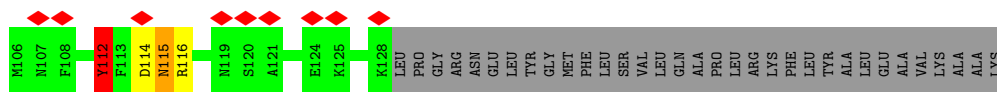


• Molecule 29: 50S ribosomal protein L9

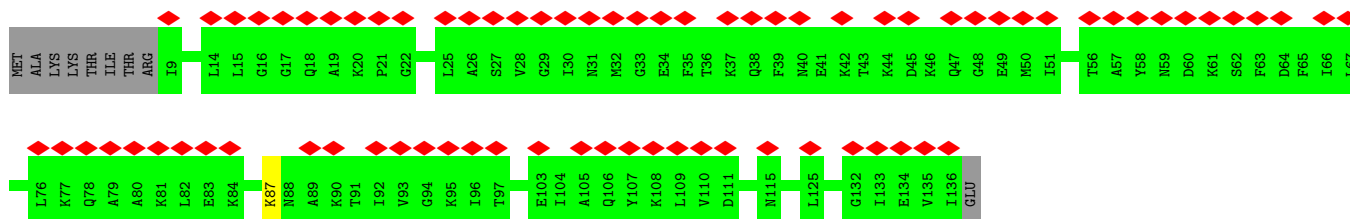
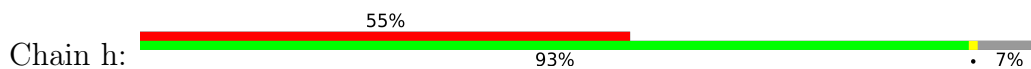


• Molecule 30: 50S ribosomal protein L10

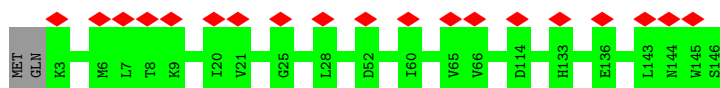




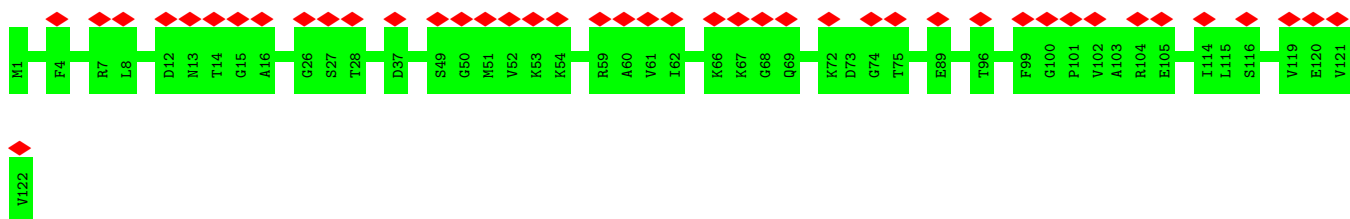
- Molecule 31: 50S ribosomal protein L11



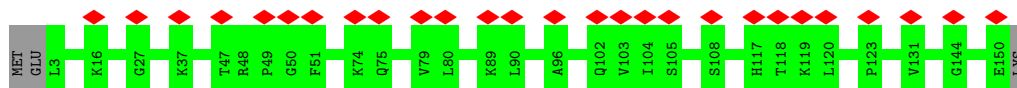
- Molecule 32: 50S ribosomal protein L13



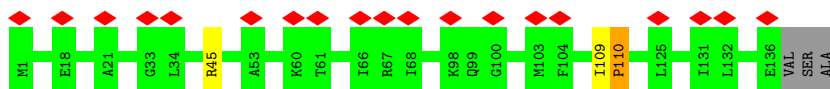
- Molecule 33: 50S ribosomal protein L14



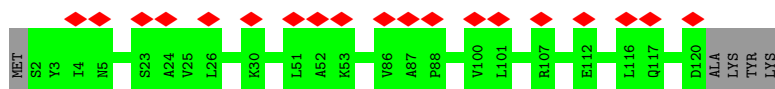
- Molecule 34: 50S ribosomal protein L15



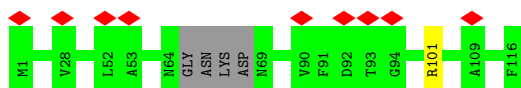
- Molecule 35: 50S ribosomal protein L16



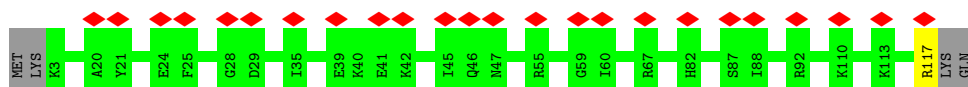
- Molecule 36: 50S ribosomal protein L17



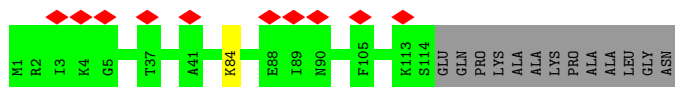
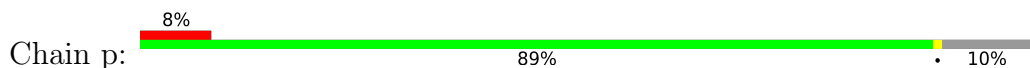
- Molecule 37: 50S ribosomal protein L18



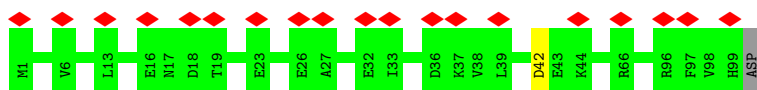
- Molecule 38: 50S ribosomal protein L19



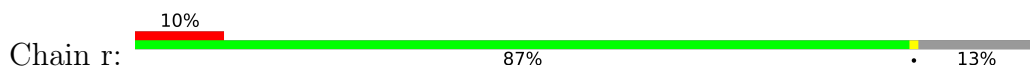
- Molecule 39: 50S ribosomal protein L20



- Molecule 40: 50S ribosomal protein L21

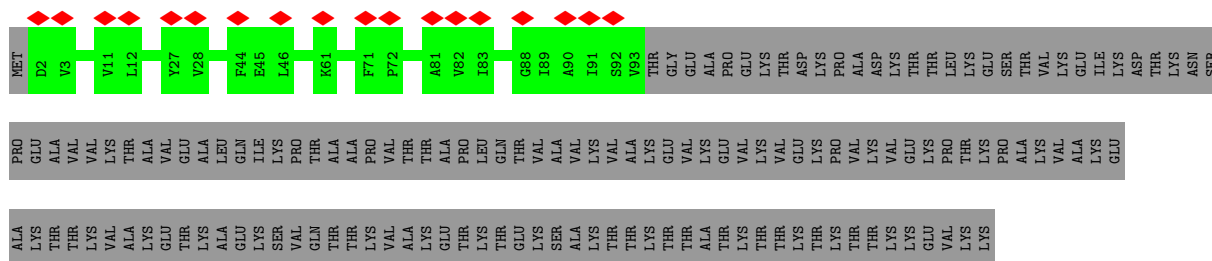


- Molecule 41: 50S ribosomal protein L22

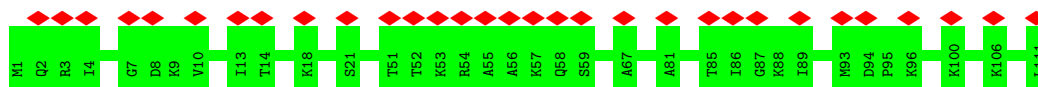


- Molecule 42: 50S ribosomal protein L23

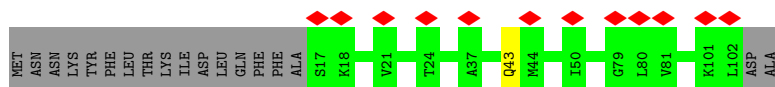
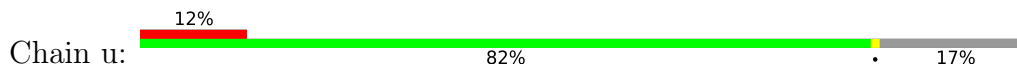




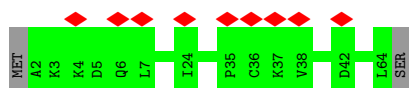
- Molecule 43: 50S ribosomal protein L24



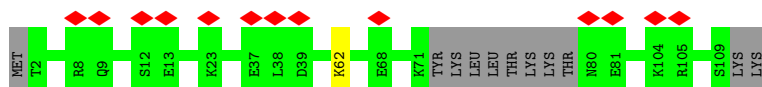
- Molecule 44: 50S ribosomal protein L27



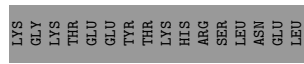
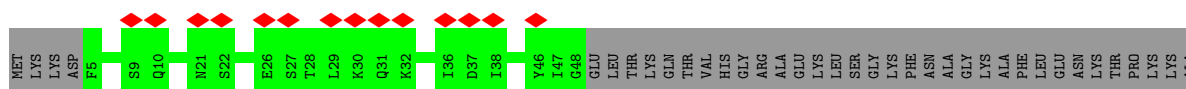
- Molecule 45: 50S ribosomal protein L28



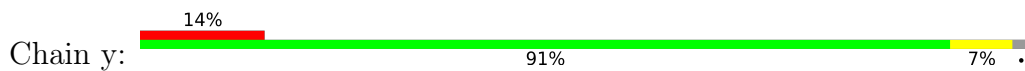
- Molecule 46: 50S ribosomal protein L29



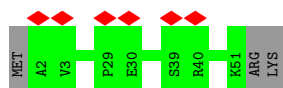
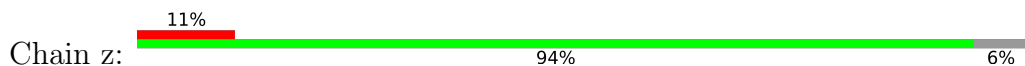
- Molecule 47: 50S ribosomal protein L31



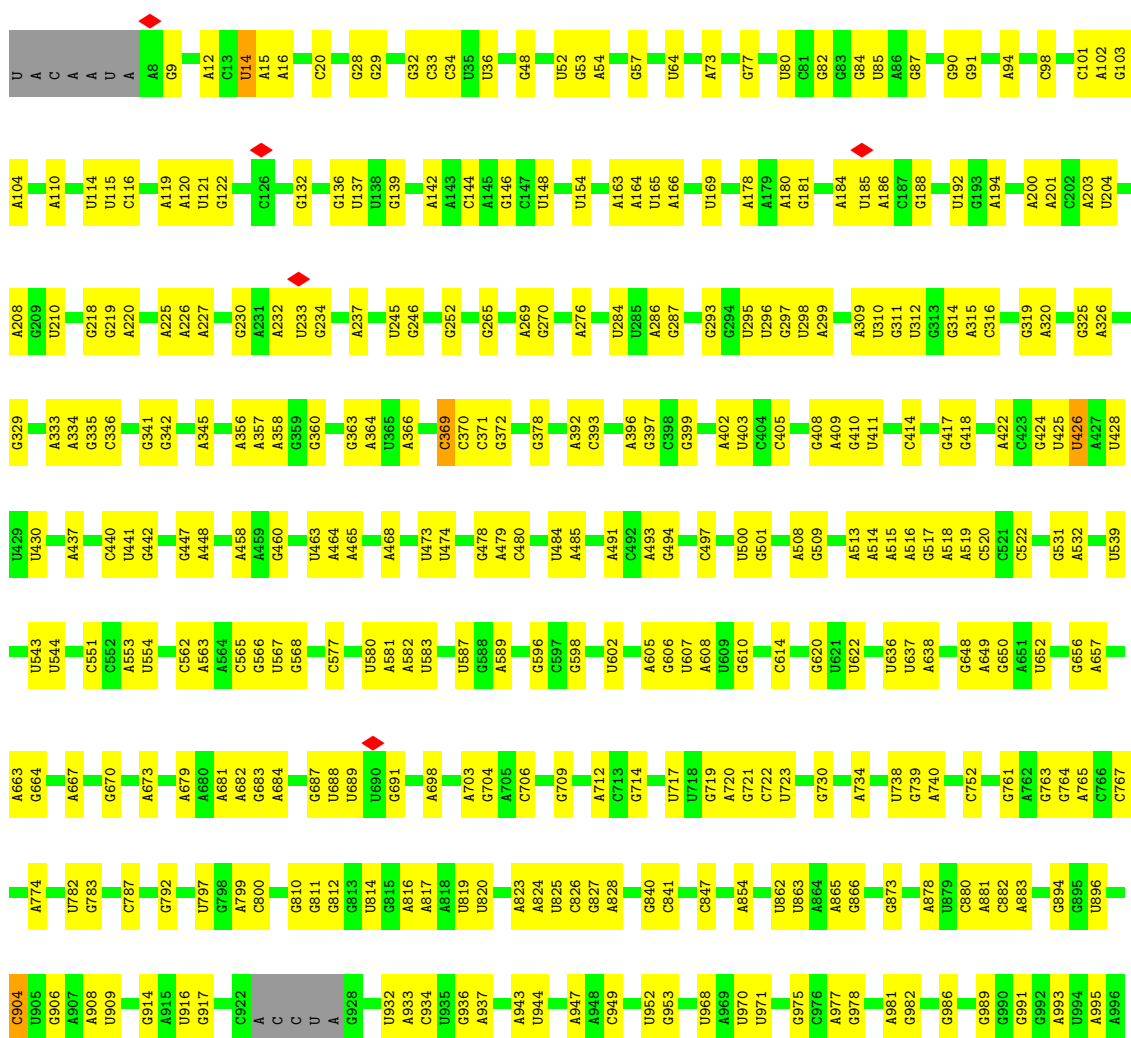
- Molecule 48: 50S ribosomal protein L32



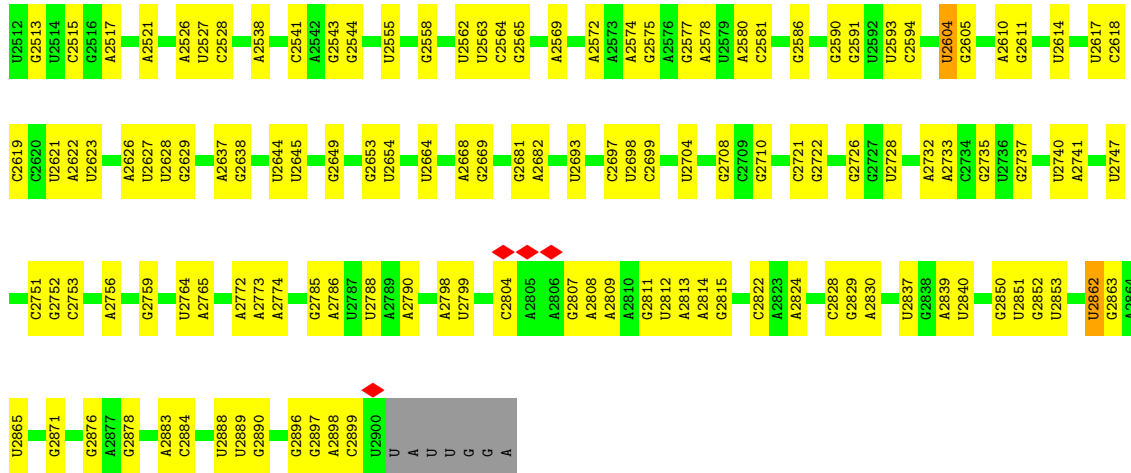
• Molecule 49: 50S ribosomal protein L33 1



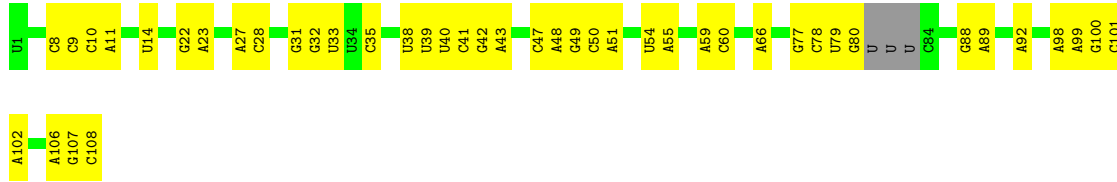
• Molecule 50: 23S ribosomal RNA



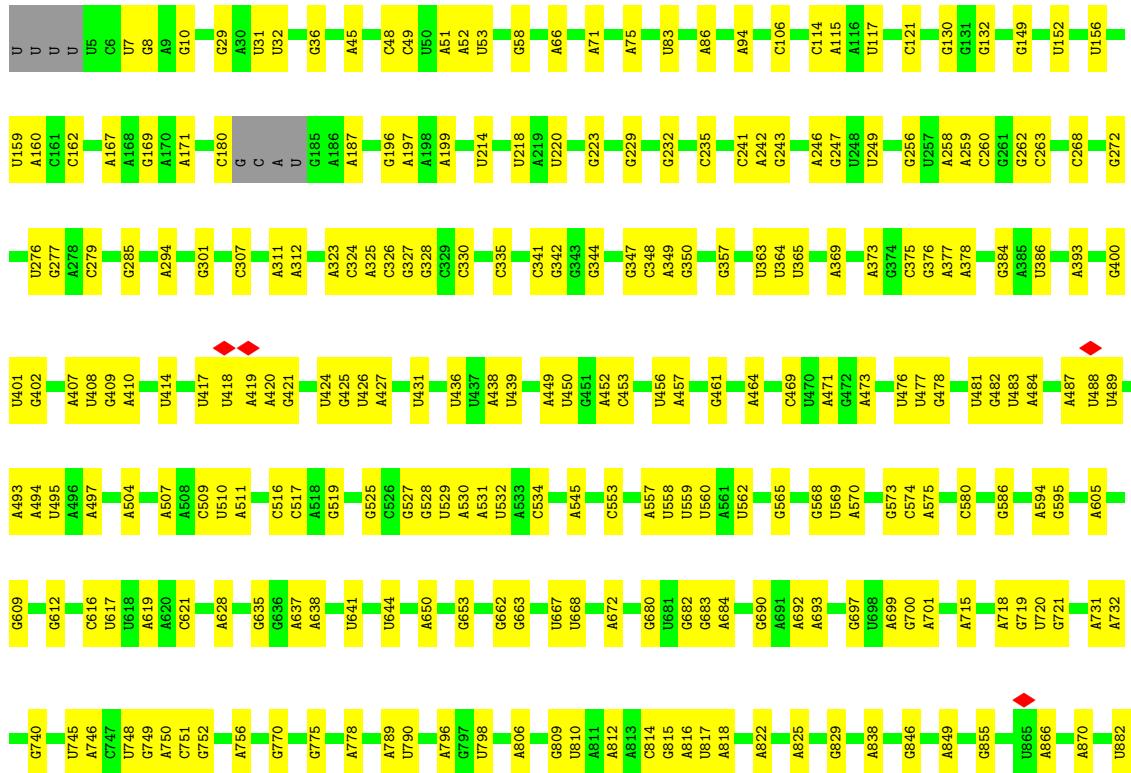
G997	A1104	A1902	U1297	G1403	U1526	G1614	C1768	A1873	A1988	G2087	U2299	C2410
C996	A1105	G1203	A1296	A1406	U1527	G1615	C1761	G1876	C1997	U2088	C2305	C2411
C1001	C1107	A1204	G1301	U1407	G1528	G1616	A1762	U1988	U1998	G2089	U2193	U2414
G1005	A1108	A1208	A1302	U1418	A1532	U1618	G1763	U1889	G1999	U2099	G2194	A2415
H1006	G1109	U1209	U1303	U1419	U1533	A1619	G1764	U1890	U2000	G2100	U2195	U2416
C1007	A1113	A1210	U1304	U1419	A1534	G1635	G1765	A1891	G2004	G2106	G2316	G2417
A1008	C1114	C1212	A1315	U1420	G1540	U1636	A1767	A1892	U2009	A2107	C2198	G2422
A1009	G1115	U1213	U1316	A1420	A1541	A1637	U1768	A1896	U2010	C2108	C2199	C2423
G1010	A1119	U1214	C1317	U1421	A1542	G1640	A1769	A1907	G2011	A2109	A2318	U2431
A1011	A1123	U1215	A1322	U1422	U1543	A1641	A1770	A1908	G2012	U2110	U2320	C2432
A1016	A1125	U1216	A1323	U1423	U1544	G1642	A1771	G1909	C2013	U2111	U2321	A2433
A1017	G1126	G1217	A1324	U1424	U1545	A1643	G1772	G1910	A2020	U2112	U2322	A2434
G1018	A1130	U1241	A1325	C1426	U1546	A1644	G1777	G1913	A2021	U2113	U2323	G2435
A1019	C1132	G1242	C1326	U1434	G1547	A1644	A1778	G1914	A2022	C2114	A2330	C2436
G1020	A1138	U1243	G1327	U1435	U1548	A1648	G1779	G1915	A2023	A2115	U2116	G2437
A1032	U1139	U1244	U1328	C1444	G1550	C1649	A1780	A1919	G2027	G2117	G2211	U2438
H1034	A1143	G1247	A1329	U1448	A1554	A1650	G1783	A1920	G2028	A2123	U2212	A2439
U1035	C1144	A1243	U1330	U1448	U1555	C1651	U1784	C1921	U2029	A2124	U2219	A2442
C1041	G1145	G1247	G1331	U1455	U1556	A1652	A1785	A1922	A2030	A2125	A2220	A2443
C1042	U1146	A1243	A1335	C1456	G1557	A1656	A1786	A1934	A2031	U2126	U2221	C2444
C1043	A1151	A1243	U1338	U1457	A1558	G1668	A1791	A1935	G2032	G2127	C2222	U2449
G1044	U1154	A1247	U1339	A1457	A1559	U1677	A1794	A1936	A2033	A2130	U2228	C2452
A1045	G1157	C1247	U1340	U1466	A1560	U1678	A1807	A1937	A2034	G2131	A2229	G2456
A1048	U1161	A1250	U1341	U1467	U1561	U1679	C1808	G1938	C2041	G2132	A2230	U2457
G1052	A1164	G1251	C1342	U1479	A1562	A1680	A1809	A1944	A2042	A2133	G2231	C2458
A1055	U1165	G1252	A1350	A1480	U1563	C1681	A1810	A1944	C2043	U2138	G2232	A2459
G1057	G1166	G1253	U1354	U1481	A1564	C1682	A1811	A1944	C2044	C2139	C2233	A2460
A1061	U1167	U1254	U1357	U1482	A1565	G1687	A1812	A1944	G2050	G2144	U2238	A2461
U1068	A1169	G1257	U1361	G1483	A1566	A1688	A1820	A1951	G2051	A2145	U2239	A2469
G1075	C1170	U1260	U1361	U1484	A1567	U1688	G1821	A1952	G2052	A2157	U2240	C2474
A1080	G1171	U1262	U1369	U1485	A1570	G1694	G1822	A1953	A2056	C2158	G2241	A2484
A1081	U1172	G1265	U1369	U1486	G1571	G1695	A1823	A1959	C2057	U1962	U2159	U2485
A1082	A1175	G1266	U1369	U1487	A1577	A1698	A1826	A1962	C2062	U1966	G2164	U2486
A1083	U1176	G1267	G1370	U1487	A1581	A1698	A1827	U1966	G2063	U1967	A2165	U2487
U1095	A1177	G1268	U1371	A1502	U1582	A1702	A1828	G1966	G2064	C1968	U2166	C2488
U1096	U1178	G1268	U1372	U1506	U1583	C1704	A1828	C1969	A2067	C1969	A2166	G2489
G1097	G1179	U1268	U1373	G1507	U1584	U1705	A1831	C1970	A2068	G1970	U2166	C2491
A1102	U1182	A1292	G1374	G1508	U1585	C1706	G1832	C1971	A2069	G1971	U2166	C2492
G1103	A1186	G1296	U1376	U1511	U1586	G1708	A1836	C1972	C2070	C1972	A2170	U2499
	U1186	A1296	A1377	A1512	U1587	U1713	C1837	U1973	C2071	U1973	A2171	C2504
	A1186	G1296	U1378	A1513	U1588	A1716	G1842	U1974	C2072	U1974	A2172	A2505
	A1295	G1296	U1378	A1514	U1589	A1716	A1855	A1977	U2075	A1977	G2173	A2506
	A1396	G1296	A1387	U1514	U1590	U1727	A1856	U1978	G2076	U1978	G2174	C2507
	A1396	G1296	U1388	A1515	G1602	U1748	A1864	G1979	G2079	G1979	U2175	U2506
	A1396	G1296	C1390	A1519	A1603	U1751	A1871	C1980	G2079	U2180	A2181	C2509
	A1396	G1296	U1393	A1520	U1612	A1751	U1872	C1986	U2083	C2182	U2183	C2511
	A1396	G1296	A1396	C1523	A1613	A1751	U1872	C1987	A2084	U2184	U2184	A2511



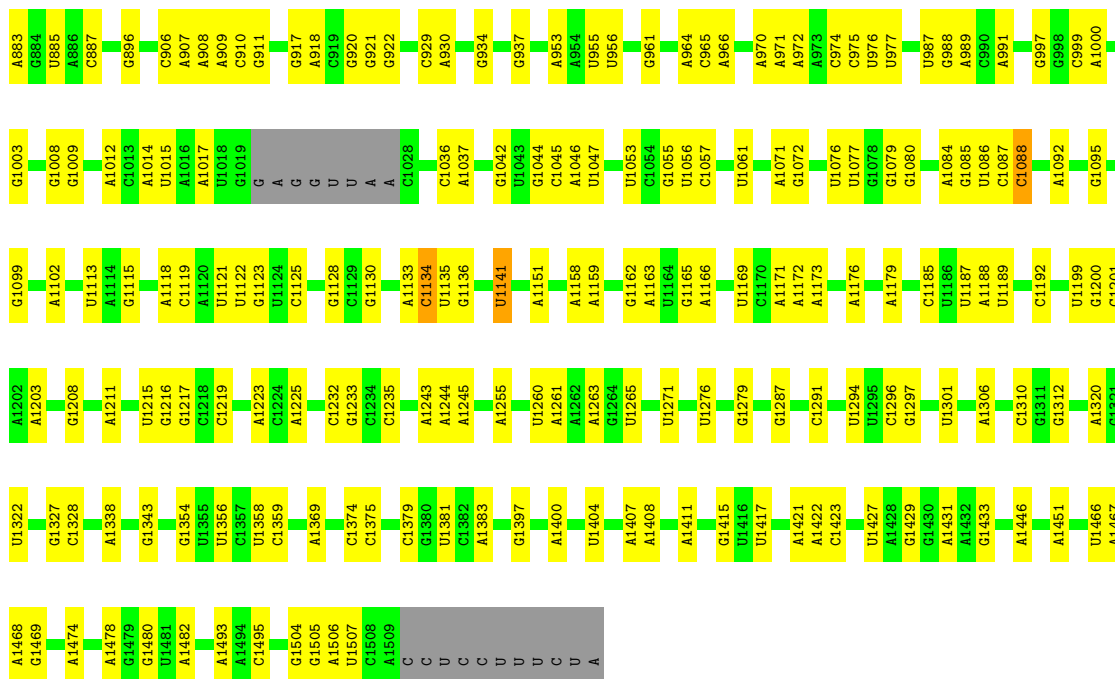
• Molecule 51: 5S ribosomal RNA



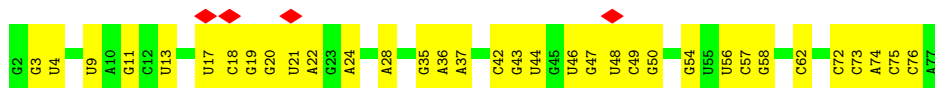
• Molecule 52: 16S ribosomal RNA



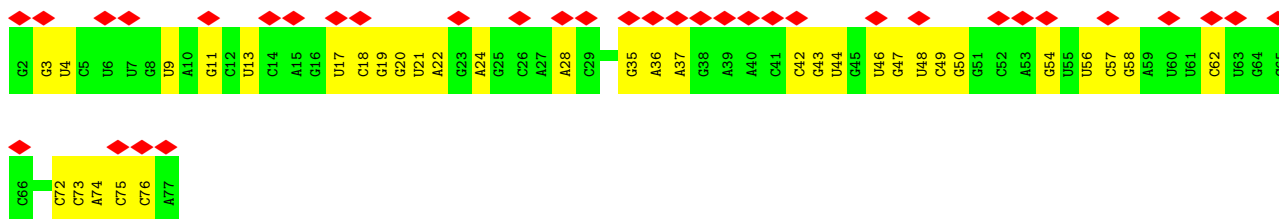




• Molecule 53: tRNA-Phe



• Molecule 53: tRNA-Phe



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SUBTOMOGRAM AVERAGING	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of subtomograms used	1803	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	3.2	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	3750	Depositor
Magnification	81000	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	1.376	Depositor
Minimum map value	-0.350	Depositor
Average map value	0.026	Depositor
Map value standard deviation	0.119	Depositor
Recommended contour level	0.47	Depositor
Map size (Å)	435.328, 435.328, 435.328	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.7005, 1.7005, 1.7005	Depositor

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

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	0	0.22	0/383	0.39	0/504
2	1	0.24	0/484	0.48	0/637
3	2	0.23	0/306	0.48	0/401
4	A	0.26	0/1954	0.48	0/2642
5	B	0.24	0/1721	0.48	0/2323
6	C	0.25	0/1691	0.46	0/2267
7	D	0.25	0/1188	0.47	0/1593
8	E	0.24	0/1384	0.47	0/1867
9	F	0.24	0/1266	0.51	0/1700
10	G	0.27	0/1126	0.54	0/1517
11	H	0.27	0/1044	0.51	0/1395
12	I	0.30	0/820	0.61	2/1103 (0.2%)
13	J	0.25	0/844	0.45	0/1136
14	K	0.29	0/1094	0.59	1/1468 (0.1%)
15	L	0.23	0/962	0.44	0/1289
16	M	0.24	0/483	0.46	0/643
17	N	0.23	0/679	0.44	0/907
18	O	0.24	0/659	0.49	0/885
19	P	0.25	0/684	0.47	0/913
20	Q	0.28	0/545	0.56	1/730 (0.1%)
21	R	0.25	0/698	0.50	0/936
22	S	0.24	0/631	0.45	0/838
23	T	0.22	0/475	0.42	0/621
24	a	0.25	0/2267	0.49	0/3044
25	b	0.25	0/1795	0.48	0/2412
26	c	0.26	0/1671	0.50	0/2246
27	d	0.28	0/1409	0.52	0/1894
28	e	0.27	0/1420	0.51	1/1912 (0.1%)
29	f	0.29	0/1183	0.60	0/1587
30	g	0.88	6/969 (0.6%)	0.68	2/1295 (0.2%)
31	h	0.25	0/968	0.46	0/1298
32	i	0.24	0/1186	0.46	0/1592
33	j	0.25	0/953	0.49	0/1275
34	k	0.24	0/1170	0.48	0/1559

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
35	l	0.24	0/1104	0.53	0/1481
36	m	0.24	0/973	0.47	0/1309
37	n	0.26	0/897	0.47	0/1198
38	o	0.24	0/948	0.45	0/1262
39	p	0.25	0/961	0.44	0/1278
40	q	0.29	0/828	0.58	2/1111 (0.2%)
41	r	0.41	0/1077	0.80	3/1441 (0.2%)
42	s	0.29	0/732	0.55	0/988
43	t	0.23	0/879	0.45	0/1165
44	u	0.25	0/665	0.49	0/884
45	v	0.23	0/519	0.46	0/695
46	w	0.23	0/826	0.45	0/1104
47	x	0.30	0/353	0.45	0/474
48	y	0.32	0/457	0.53	0/601
49	z	0.23	0/412	0.42	0/547
50	3	0.23	0/69073	0.85	50/107710 (0.0%)
51	4	0.21	0/2505	0.83	4/3902 (0.1%)
52	5	0.22	0/35768	0.83	26/55764 (0.0%)
53	7	0.22	0/1808	0.86	2/2817 (0.1%)
53	8	0.22	0/1808	0.86	2/2817 (0.1%)
All	All	0.25	6/158705 (0.0%)	0.77	96/236977 (0.0%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
6	C	0	1
10	G	0	1
21	R	0	1
29	f	0	1
30	g	0	2
35	l	0	1
All	All	0	7

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
30	g	112	TYR	CG-CD1	14.84	1.58	1.39
30	g	112	TYR	CG-CD2	12.44	1.55	1.39
30	g	112	TYR	CE1-CZ	8.21	1.49	1.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
30	g	112	TYR	CE2-CZ	8.06	1.49	1.38
30	g	112	TYR	CD1-CE1	7.58	1.50	1.39
30	g	112	TYR	CD2-CE2	7.40	1.50	1.39

All (96) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
41	r	99	ARG	NE-CZ-NH2	15.80	128.20	120.30
41	r	99	ARG	NE-CZ-NH1	-14.49	113.05	120.30
50	3	370	C	N3-C2-O2	-10.41	114.61	121.90
50	3	371	C	N3-C2-O2	-9.04	115.57	121.90
52	5	268	C	N3-C2-O2	-8.88	115.69	121.90
50	3	1507	G	O4'-C1'-N9	8.48	114.98	108.20
50	3	767	C	N3-C2-O2	-8.32	116.08	121.90
52	5	616	C	N1-C2-O2	8.23	123.84	118.90
51	4	79	U	C2-N1-C1'	8.22	127.57	117.70
50	3	1987	C	N3-C2-O2	-7.89	116.37	121.90
52	5	616	C	C2-N1-C1'	7.85	127.43	118.80
52	5	1088	C	N3-C2-O2	-7.85	116.41	121.90
52	5	1185	C	N3-C2-O2	-7.67	116.53	121.90
51	4	79	U	N1-C2-O2	7.65	128.16	122.80
50	3	14	U	C2-N1-C1'	7.60	126.82	117.70
51	4	79	U	N3-C2-O2	-7.53	116.93	122.20
50	3	904	C	N1-C2-O2	7.46	123.38	118.90
50	3	2402	C	N1-C2-O2	7.32	123.29	118.90
52	5	1219	C	N3-C2-O2	-7.32	116.78	121.90
50	3	370	C	N1-C2-O2	7.30	123.28	118.90
30	g	112	TYR	CB-CA-C	7.26	124.92	110.40
52	5	1134	C	N1-C2-O2	7.18	123.21	118.90
52	5	1134	C	C2-N1-C1'	7.06	126.57	118.80
50	3	1341	U	N1-C2-O2	7.02	127.72	122.80
50	3	34	C	N3-C2-O2	-7.01	116.99	121.90
50	3	1010	G	O4'-C1'-N9	6.96	113.77	108.20
53	8	73	C	N3-C2-O2	-6.96	117.03	121.90
50	3	1341	U	C2-N1-C1'	6.92	126.01	117.70
52	5	307	C	N1-C2-O2	6.87	123.02	118.90
53	7	73	C	N3-C2-O2	-6.87	117.09	121.90
50	3	2402	C	C2-N1-C1'	6.79	126.27	118.80
40	q	42	ASP	CB-CG-OD2	-6.74	112.24	118.30
52	5	307	C	N3-C2-O2	-6.74	117.18	121.90
52	5	616	C	N3-C2-O2	-6.69	117.22	121.90
50	3	14	U	N1-C2-O2	6.66	127.46	122.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
28	e	155	ARG	C-N-CA	6.63	138.28	121.70
41	r	99	ARG	CB-CG-CD	6.60	128.75	111.60
50	3	767	C	C6-N1-C2	-6.37	117.75	120.30
50	3	1341	U	N3-C2-O2	-6.33	117.77	122.20
50	3	1043	C	N3-C2-O2	-6.31	117.48	121.90
52	5	751	C	C2-N1-C1'	6.30	125.73	118.80
50	3	371	C	C6-N1-C2	-6.24	117.80	120.30
52	5	974	C	N1-C2-O2	6.22	122.64	118.90
52	5	616	C	C6-N1-C2	-6.18	117.83	120.30
50	3	1986	C	N1-C2-O2	6.17	122.60	118.90
50	3	1997	C	N3-C2-O2	-6.17	117.58	121.90
52	5	268	C	N1-C2-O2	6.12	122.57	118.90
50	3	1262	G	N3-C4-N9	6.11	129.66	126.00
50	3	360	G	N1-C6-O6	-6.09	116.25	119.90
12	I	33	GLU	CA-CB-CG	6.00	126.59	113.40
50	3	2862	U	P-O3'-C3'	5.96	126.86	119.70
50	3	904	C	C2-N1-C1'	5.95	125.34	118.80
50	3	1042	C	N1-C2-O2	5.93	122.46	118.90
50	3	1247	C	N3-C2-O2	-5.92	117.76	121.90
52	5	1134	C	N3-C2-O2	-5.91	117.76	121.90
50	3	369	C	N1-C2-O2	5.91	122.45	118.90
40	q	42	ASP	CB-CG-OD1	5.89	123.60	118.30
50	3	1507	G	C4-N9-C1'	-5.87	118.87	126.50
50	3	426	U	C2-N1-C1'	5.82	124.68	117.70
50	3	2604	U	P-O3'-C3'	5.80	126.66	119.70
12	I	32	VAL	C-N-CA	-5.79	107.22	121.70
50	3	14	U	N3-C2-O2	-5.72	118.20	122.20
53	8	42	C	N3-C2-O2	-5.66	117.94	121.90
50	3	144	C	N3-C2-O2	-5.66	117.94	121.90
53	7	42	C	N3-C2-O2	-5.65	117.95	121.90
50	3	360	G	C5-C6-O6	5.63	131.98	128.60
20	Q	91	LYS	CD-CE-NZ	5.59	124.55	111.70
52	5	1080	G	C5-C6-O6	5.57	131.94	128.60
50	3	1987	C	C6-N1-C2	-5.57	118.07	120.30
50	3	34	C	C6-N1-C2	-5.57	118.07	120.30
50	3	1507	G	C8-N9-C1'	5.56	134.23	127.00
52	5	1119	C	C2-N1-C1'	5.54	124.89	118.80
52	5	1080	G	N1-C6-O6	-5.50	116.60	119.90
50	3	360	G	N1-C2-N2	-5.50	111.25	116.20
50	3	904	C	N3-C2-O2	-5.48	118.06	121.90
52	5	974	C	C2-N1-C1'	5.46	124.81	118.80
50	3	2402	C	N3-C2-O2	-5.44	118.09	121.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
30	g	112	TYR	CG-CD2-CE2	-5.42	116.96	121.30
14	K	31	LEU	CA-CB-CG	5.37	127.66	115.30
52	5	751	C	N1-C2-O2	5.33	122.10	118.90
50	3	33	C	N1-C2-O2	5.28	122.07	118.90
50	3	371	C	N1-C2-N3	5.26	122.89	119.20
50	3	2071	C	C2-N1-C1'	5.23	124.56	118.80
52	5	748	U	C2-N1-C1'	5.17	123.90	117.70
52	5	616	C	C6-N1-C1'	-5.16	114.61	120.80
52	5	751	C	C6-N1-C1'	-5.16	114.61	120.80
52	5	1141	U	O4'-C1'-N1	5.11	112.28	108.20
50	3	1778	G	N3-C4-N9	5.10	129.06	126.00
50	3	14	U	C6-N1-C1'	-5.07	114.10	121.20
51	4	79	U	C6-N1-C1'	-5.07	114.10	121.20
50	3	370	C	C6-N1-C2	-5.06	118.28	120.30
50	3	1172	G	C5-C6-O6	5.06	131.63	128.60
50	3	1171	G	N3-C4-N9	5.05	129.03	126.00
50	3	426	U	N1-C2-O2	5.03	126.32	122.80
50	3	1371	G	C4-N9-C1'	5.02	133.03	126.50
52	5	1125	C	C6-N1-C2	-5.00	118.30	120.30

There are no chirality outliers.

All (7) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
6	C	21	ASN	Peptide
10	G	108	LEU	Peptide
21	R	25	GLN	Peptide
29	f	11	ASN	Peptide
30	g	112	TYR	Sidechain
30	g	114	ASP	Mainchain
35	l	110	PRO	Peptide

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

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

## 5.3 Torsion angles

### 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	
1	0	45/48 (94%)	44 (98%)	1 (2%)	0	100	100
2	1	57/59 (97%)	50 (88%)	7 (12%)	0	100	100
3	2	35/37 (95%)	34 (97%)	1 (3%)	0	100	100
4	A	238/294 (81%)	221 (93%)	17 (7%)	0	100	100
5	B	213/273 (78%)	201 (94%)	12 (6%)	0	100	100
6	C	201/205 (98%)	185 (92%)	15 (8%)	1 (0%)	29	69
7	D	151/219 (69%)	138 (91%)	13 (9%)	0	100	100
8	E	165/215 (77%)	147 (89%)	18 (11%)	0	100	100
9	F	152/155 (98%)	136 (90%)	16 (10%)	0	100	100
10	G	139/142 (98%)	123 (88%)	16 (12%)	0	100	100
11	H	126/132 (96%)	112 (89%)	14 (11%)	0	100	100
12	I	99/108 (92%)	93 (94%)	6 (6%)	0	100	100
13	J	112/121 (93%)	104 (93%)	8 (7%)	0	100	100
14	K	134/139 (96%)	111 (83%)	23 (17%)	0	100	100
15	L	116/124 (94%)	100 (86%)	16 (14%)	0	100	100
16	M	58/61 (95%)	52 (90%)	6 (10%)	0	100	100
17	N	81/86 (94%)	78 (96%)	3 (4%)	0	100	100
18	O	78/94 (83%)	70 (90%)	8 (10%)	0	100	100
19	P	81/85 (95%)	73 (90%)	8 (10%)	0	100	100
20	Q	63/104 (61%)	51 (81%)	12 (19%)	0	100	100
21	R	82/87 (94%)	70 (85%)	12 (15%)	0	100	100
22	S	75/87 (86%)	68 (91%)	7 (9%)	0	100	100
23	T	51/60 (85%)	51 (100%)	0	0	100	100
24	a	283/287 (99%)	259 (92%)	24 (8%)	0	100	100
25	b	227/287 (79%)	202 (89%)	25 (11%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
26	c	208/212 (98%)	195 (94%)	13 (6%)	0	100	100
27	d	173/180 (96%)	158 (91%)	15 (9%)	0	100	100
28	e	174/184 (95%)	164 (94%)	10 (6%)	0	100	100
29	f	143/149 (96%)	125 (87%)	17 (12%)	1 (1%)	22	63
30	g	124/161 (77%)	109 (88%)	12 (10%)	3 (2%)	6	33
31	h	126/137 (92%)	111 (88%)	15 (12%)	0	100	100
32	i	142/146 (97%)	131 (92%)	11 (8%)	0	100	100
33	j	120/122 (98%)	114 (95%)	6 (5%)	0	100	100
34	k	146/151 (97%)	134 (92%)	12 (8%)	0	100	100
35	l	134/139 (96%)	121 (90%)	11 (8%)	2 (2%)	10	46
36	m	117/124 (94%)	110 (94%)	7 (6%)	0	100	100
37	n	108/116 (93%)	99 (92%)	9 (8%)	0	100	100
38	o	113/119 (95%)	106 (94%)	7 (6%)	0	100	100
39	p	112/127 (88%)	109 (97%)	3 (3%)	0	100	100
40	q	97/100 (97%)	86 (89%)	11 (11%)	0	100	100
41	r	137/159 (86%)	127 (93%)	10 (7%)	0	100	100
42	s	90/237 (38%)	85 (94%)	5 (6%)	0	100	100
43	t	109/111 (98%)	101 (93%)	8 (7%)	0	100	100
44	u	84/104 (81%)	79 (94%)	5 (6%)	0	100	100
45	v	61/65 (94%)	59 (97%)	2 (3%)	0	100	100
46	w	96/111 (86%)	90 (94%)	6 (6%)	0	100	100
47	x	42/97 (43%)	41 (98%)	1 (2%)	0	100	100
48	y	54/57 (95%)	47 (87%)	7 (13%)	0	100	100
49	z	48/53 (91%)	46 (96%)	2 (4%)	0	100	100
All	All	5820/6670 (87%)	5320 (91%)	493 (8%)	7 (0%)	54	86

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
30	g	115	ASN
30	g	31	SER
30	g	86	VAL
6	C	146	ALA
29	f	12	LEU

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Mol	Chain	Res	Type
35	1	109	ILE
35	1	110	PRO

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

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	0	40/41 (98%)	40 (100%)	0	100	100
2	1	51/51 (100%)	51 (100%)	0	100	100
3	2	35/35 (100%)	35 (100%)	0	100	100
4	A	212/262 (81%)	211 (100%)	1 (0%)	88	93
5	B	180/232 (78%)	179 (99%)	1 (1%)	86	92
6	C	181/183 (99%)	179 (99%)	2 (1%)	73	84
7	D	123/178 (69%)	122 (99%)	1 (1%)	81	89
8	E	150/196 (76%)	149 (99%)	1 (1%)	84	90
9	F	131/132 (99%)	130 (99%)	1 (1%)	81	89
10	G	123/124 (99%)	122 (99%)	1 (1%)	81	89
11	H	111/115 (96%)	108 (97%)	3 (3%)	44	65
12	I	95/99 (96%)	95 (100%)	0	100	100
13	J	91/97 (94%)	90 (99%)	1 (1%)	73	84
14	K	117/120 (98%)	116 (99%)	1 (1%)	78	87
15	L	100/105 (95%)	99 (99%)	1 (1%)	76	86
16	M	47/48 (98%)	47 (100%)	0	100	100
17	N	76/78 (97%)	76 (100%)	0	100	100
18	O	69/82 (84%)	69 (100%)	0	100	100
19	P	73/75 (97%)	73 (100%)	0	100	100
20	Q	56/94 (60%)	56 (100%)	0	100	100
21	R	74/77 (96%)	74 (100%)	0	100	100
22	S	70/77 (91%)	69 (99%)	1 (1%)	67	80

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
23	T	49/56 (88%)	48 (98%)	1 (2%)	55	74
24	a	241/243 (99%)	238 (99%)	3 (1%)	71	83
25	b	186/233 (80%)	185 (100%)	1 (0%)	88	93
26	c	182/184 (99%)	180 (99%)	2 (1%)	73	84
27	d	150/154 (97%)	149 (99%)	1 (1%)	84	90
28	e	153/159 (96%)	153 (100%)	0	100	100
29	f	123/134 (92%)	123 (100%)	0	100	100
30	g	101/129 (78%)	93 (92%)	8 (8%)	12	35
31	h	102/110 (93%)	101 (99%)	1 (1%)	76	86
32	i	126/128 (98%)	126 (100%)	0	100	100
33	j	103/103 (100%)	103 (100%)	0	100	100
34	k	123/126 (98%)	123 (100%)	0	100	100
35	l	113/115 (98%)	112 (99%)	1 (1%)	78	87
36	m	105/109 (96%)	105 (100%)	0	100	100
37	n	96/99 (97%)	95 (99%)	1 (1%)	76	86
38	o	101/105 (96%)	100 (99%)	1 (1%)	76	86
39	p	100/108 (93%)	99 (99%)	1 (1%)	76	86
40	q	90/91 (99%)	90 (100%)	0	100	100
41	r	116/132 (88%)	116 (100%)	0	100	100
42	s	82/208 (39%)	82 (100%)	0	100	100
43	t	96/96 (100%)	96 (100%)	0	100	100
44	u	69/85 (81%)	68 (99%)	1 (1%)	67	80
45	v	58/60 (97%)	58 (100%)	0	100	100
46	w	87/98 (89%)	86 (99%)	1 (1%)	73	84
47	x	41/86 (48%)	41 (100%)	0	100	100
48	y	48/49 (98%)	44 (92%)	4 (8%)	11	34
49	z	47/50 (94%)	47 (100%)	0	100	100
All	All	5093/5751 (89%)	5051 (99%)	42 (1%)	82	89

All (42) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	A	27	ARG

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Mol	Chain	Res	Type
5	B	90	LYS
6	C	143	ARG
6	C	202	ARG
7	D	148	ARG
8	E	80	LYS
9	F	71	ARG
10	G	23	ASN
11	H	4	GLN
11	H	34	ARG
11	H	108	ARG
13	J	49	ARG
14	K	121	GLU
15	L	71	ARG
22	S	18	ASN
23	T	53	ARG
24	a	56	ARG
24	a	61	ARG
24	a	229	ARG
25	b	180	ARG
26	c	148	LYS
26	c	179	GLN
27	d	125	ARG
30	g	45	PHE
30	g	46	LYS
30	g	86	VAL
30	g	89	ILE
30	g	91	GLU
30	g	112	TYR
30	g	115	ASN
30	g	116	ARG
31	h	87	LYS
35	l	45	ARG
37	n	101	ARG
38	o	117	ARG
39	p	84	LYS
44	u	43	GLN
46	w	62	LYS
48	y	47	MET
48	y	51	LEU
48	y	52	ARG
48	y	54	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (38)

such sidechains are listed below:

Mol	Chain	Res	Type
4	A	53	ASN
4	A	61	GLN
4	A	70	ASN
4	A	149	ASN
4	A	220	HIS
4	A	223	GLN
5	B	29	GLN
5	B	52	GLN
5	B	62	GLN
6	C	52	GLN
6	C	58	GLN
6	C	99	ASN
6	C	118	ASN
9	F	51	GLN
13	J	95	ASN
14	K	86	ASN
14	K	109	HIS
19	P	25	GLN
20	Q	82	HIS
24	a	78	ASN
24	a	149	ASN
24	a	205	ASN
24	a	208	HIS
25	b	99	GLN
25	b	177	GLN
26	c	68	GLN
26	c	76	GLN
26	c	81	ASN
26	c	167	ASN
27	d	37	ASN
29	f	84	HIS
32	i	11	GLN
34	k	36	GLN
36	m	59	ASN
41	r	60	ASN
41	r	110	ASN
42	s	19	ASN
49	z	24	ASN

### 5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
50	3	2875/2907 (98%)	964 (33%)	41 (1%)
51	4	103/108 (95%)	42 (40%)	3 (2%)
52	5	1490/1520 (98%)	427 (28%)	6 (0%)
53	7	75/76 (98%)	32 (42%)	2 (2%)
53	8	75/76 (98%)	32 (42%)	2 (2%)
All	All	4618/4687 (98%)	1497 (32%)	54 (1%)

All (1497) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
50	3	9	G
50	3	12	A
50	3	14	U
50	3	15	A
50	3	16	A
50	3	20	C
50	3	28	G
50	3	29	G
50	3	32	G
50	3	36	U
50	3	48	G
50	3	52	U
50	3	53	G
50	3	54	A
50	3	57	G
50	3	64	U
50	3	73	A
50	3	77	G
50	3	80	U
50	3	82	G
50	3	84	G
50	3	85	U
50	3	87	G
50	3	90	G
50	3	91	G
50	3	94	A
50	3	98	C
50	3	101	C
50	3	102	A
50	3	103	G
50	3	104	A
50	3	110	A
50	3	114	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	115	U
50	3	116	C
50	3	119	A
50	3	120	A
50	3	121	U
50	3	122	G
50	3	132	G
50	3	136	G
50	3	137	U
50	3	139	G
50	3	142	A
50	3	146	G
50	3	148	U
50	3	154	U
50	3	163	A
50	3	164	A
50	3	165	U
50	3	166	A
50	3	169	U
50	3	178	A
50	3	180	A
50	3	181	G
50	3	184	A
50	3	185	U
50	3	186	A
50	3	188	G
50	3	192	U
50	3	194	A
50	3	200	A
50	3	201	A
50	3	203	A
50	3	204	U
50	3	208	A
50	3	210	U
50	3	218	G
50	3	219	G
50	3	220	A
50	3	225	A
50	3	226	A
50	3	227	A
50	3	230	G
50	3	232	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	233	U
50	3	234	G
50	3	237	A
50	3	245	U
50	3	246	G
50	3	252	G
50	3	265	G
50	3	269	A
50	3	270	G
50	3	276	A
50	3	284	U
50	3	286	A
50	3	287	G
50	3	293	G
50	3	295	U
50	3	296	U
50	3	297	G
50	3	298	U
50	3	299	A
50	3	309	A
50	3	310	U
50	3	311	G
50	3	312	U
50	3	314	G
50	3	315	A
50	3	316	C
50	3	319	G
50	3	320	A
50	3	325	G
50	3	326	A
50	3	329	G
50	3	333	A
50	3	334	A
50	3	335	G
50	3	336	C
50	3	341	G
50	3	342	G
50	3	345	A
50	3	356	A
50	3	357	A
50	3	358	A
50	3	363	G

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	364	A
50	3	366	A
50	3	369	C
50	3	372	G
50	3	378	G
50	3	392	A
50	3	393	C
50	3	396	A
50	3	397	G
50	3	399	G
50	3	402	A
50	3	403	U
50	3	405	C
50	3	408	G
50	3	409	A
50	3	410	G
50	3	411	U
50	3	414	C
50	3	417	G
50	3	418	G
50	3	422	A
50	3	424	G
50	3	425	U
50	3	426	U
50	3	428	U
50	3	430	U
50	3	437	A
50	3	440	C
50	3	441	U
50	3	442	G
50	3	447	G
50	3	448	A
50	3	458	A
50	3	460	G
50	3	463	U
50	3	464	A
50	3	465	A
50	3	468	A
50	3	473	U
50	3	474	U
50	3	478	G
50	3	479	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	480	C
50	3	484	U
50	3	485	A
50	3	491	A
50	3	493	A
50	3	494	G
50	3	497	C
50	3	501	G
50	3	508	A
50	3	509	G
50	3	514	A
50	3	515	A
50	3	516	A
50	3	517	G
50	3	518	A
50	3	519	A
50	3	520	C
50	3	522	C
50	3	531	G
50	3	532	A
50	3	539	U
50	3	543	U
50	3	544	U
50	3	551	C
50	3	553	A
50	3	554	U
50	3	562	C
50	3	563	A
50	3	565	C
50	3	566	G
50	3	567	U
50	3	568	G
50	3	577	C
50	3	580	U
50	3	581	A
50	3	582	A
50	3	583	U
50	3	587	U
50	3	589	A
50	3	596	G
50	3	598	G
50	3	602	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	605	A
50	3	606	G
50	3	607	U
50	3	608	A
50	3	610	G
50	3	614	C
50	3	620	G
50	3	622	U
50	3	636	U
50	3	637	U
50	3	638	A
50	3	648	G
50	3	649	A
50	3	650	G
50	3	652	U
50	3	656	G
50	3	657	A
50	3	663	A
50	3	664	G
50	3	667	A
50	3	670	G
50	3	673	A
50	3	679	A
50	3	681	A
50	3	682	A
50	3	683	G
50	3	684	A
50	3	687	G
50	3	689	U
50	3	691	G
50	3	698	A
50	3	703	A
50	3	704	G
50	3	706	C
50	3	709	G
50	3	712	A
50	3	714	G
50	3	717	U
50	3	719	G
50	3	720	A
50	3	721	G
50	3	722	C

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	723	U
50	3	730	G
50	3	734	A
50	3	738	U
50	3	739	G
50	3	740	A
50	3	752	C
50	3	761	G
50	3	763	G
50	3	764	G
50	3	765	A
50	3	774	A
50	3	782	U
50	3	783	G
50	3	787	C
50	3	792	G
50	3	797	U
50	3	799	A
50	3	800	C
50	3	810	G
50	3	811	G
50	3	812	G
50	3	814	U
50	3	816	A
50	3	817	A
50	3	819	U
50	3	820	U
50	3	823	A
50	3	824	A
50	3	825	U
50	3	826	C
50	3	827	G
50	3	828	A
50	3	840	G
50	3	841	C
50	3	847	C
50	3	854	A
50	3	862	U
50	3	863	U
50	3	865	A
50	3	866	G
50	3	873	G

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	878	A
50	3	880	C
50	3	881	A
50	3	882	C
50	3	883	A
50	3	894	G
50	3	896	U
50	3	904	C
50	3	906	G
50	3	908	A
50	3	909	U
50	3	914	G
50	3	916	U
50	3	917	G
50	3	932	U
50	3	933	A
50	3	934	C
50	3	936	G
50	3	937	A
50	3	943	A
50	3	944	U
50	3	947	A
50	3	949	C
50	3	952	U
50	3	953	G
50	3	968	U
50	3	970	U
50	3	971	U
50	3	975	G
50	3	977	A
50	3	978	G
50	3	981	A
50	3	982	G
50	3	986	G
50	3	989	G
50	3	991	G
50	3	993	A
50	3	995	A
50	3	997	G
50	3	998	C
50	3	1001	C
50	3	1005	G

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	1007	C
50	3	1009	A
50	3	1010	G
50	3	1011	A
50	3	1016	A
50	3	1017	A
50	3	1018	G
50	3	1019	A
50	3	1021	C
50	3	1026	A
50	3	1027	U
50	3	1032	A
50	3	1033	A
50	3	1035	U
50	3	1041	C
50	3	1045	A
50	3	1049	U
50	3	1052	A
50	3	1055	A
50	3	1056	A
50	3	1057	G
50	3	1061	A
50	3	1068	U
50	3	1075	G
50	3	1080	A
50	3	1081	A
50	3	1082	A
50	3	1083	A
50	3	1095	U
50	3	1096	U
50	3	1097	G
50	3	1102	A
50	3	1103	G
50	3	1104	A
50	3	1105	A
50	3	1106	G
50	3	1108	A
50	3	1113	U
50	3	1115	G
50	3	1119	A
50	3	1123	A
50	3	1125	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	1126	G
50	3	1130	A
50	3	1132	C
50	3	1138	A
50	3	1143	U
50	3	1144	C
50	3	1145	G
50	3	1147	G
50	3	1148	U
50	3	1151	U
50	3	1154	U
50	3	1157	G
50	3	1161	A
50	3	1164	A
50	3	1165	U
50	3	1167	U
50	3	1168	A
50	3	1170	C
50	3	1171	G
50	3	1175	C
50	3	1176	U
50	3	1177	A
50	3	1178	A
50	3	1179	G
50	3	1182	U
50	3	1186	A
50	3	1201	A
50	3	1203	G
50	3	1204	A
50	3	1208	A
50	3	1209	U
50	3	1210	A
50	3	1212	C
50	3	1213	U
50	3	1215	G
50	3	1216	U
50	3	1217	G
50	3	1231	G
50	3	1234	U
50	3	1235	U
50	3	1236	G
50	3	1241	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	1242	G
50	3	1243	A
50	3	1250	A
50	3	1251	G
50	3	1253	G
50	3	1255	G
50	3	1256	A
50	3	1257	G
50	3	1260	U
50	3	1265	G
50	3	1266	G
50	3	1268	U
50	3	1277	A
50	3	1279	U
50	3	1281	A
50	3	1282	G
50	3	1283	A
50	3	1285	U
50	3	1286	G
50	3	1292	A
50	3	1295	A
50	3	1297	U
50	3	1298	A
50	3	1301	G
50	3	1302	C
50	3	1304	U
50	3	1315	A
50	3	1316	U
50	3	1317	C
50	3	1322	A
50	3	1324	A
50	3	1326	C
50	3	1328	A
50	3	1329	U
50	3	1330	U
50	3	1331	G
50	3	1335	A
50	3	1338	G
50	3	1340	U
50	3	1342	C
50	3	1350	A
50	3	1354	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	1357	U
50	3	1360	U
50	3	1361	U
50	3	1368	U
50	3	1369	U
50	3	1372	U
50	3	1373	C
50	3	1375	G
50	3	1376	G
50	3	1378	C
50	3	1387	A
50	3	1388	G
50	3	1390	C
50	3	1393	A
50	3	1396	A
50	3	1403	G
50	3	1406	A
50	3	1407	U
50	3	1418	U
50	3	1420	A
50	3	1421	A
50	3	1422	U
50	3	1423	A
50	3	1424	U
50	3	1425	U
50	3	1426	C
50	3	1434	U
50	3	1435	A
50	3	1444	C
50	3	1448	U
50	3	1455	A
50	3	1456	C
50	3	1457	A
50	3	1463	G
50	3	1466	U
50	3	1467	U
50	3	1479	A
50	3	1480	A
50	3	1481	U
50	3	1482	U
50	3	1483	G
50	3	1485	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	1487	U
50	3	1502	A
50	3	1506	U
50	3	1507	G
50	3	1508	G
50	3	1511	C
50	3	1513	A
50	3	1514	U
50	3	1515	A
50	3	1517	G
50	3	1518	C
50	3	1520	A
50	3	1523	C
50	3	1526	U
50	3	1528	G
50	3	1532	A
50	3	1533	U
50	3	1534	A
50	3	1540	G
50	3	1541	A
50	3	1542	G
50	3	1543	U
50	3	1546	U
50	3	1548	A
50	3	1550	G
50	3	1554	A
50	3	1555	G
50	3	1557	G
50	3	1559	A
50	3	1571	G
50	3	1577	A
50	3	1581	U
50	3	1584	U
50	3	1585	A
50	3	1586	U
50	3	1588	A
50	3	1589	A
50	3	1594	G
50	3	1600	A
50	3	1601	A
50	3	1603	A
50	3	1612	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	1613	A
50	3	1614	G
50	3	1615	G
50	3	1616	G
50	3	1618	U
50	3	1619	A
50	3	1635	G
50	3	1636	U
50	3	1637	A
50	3	1640	G
50	3	1641	A
50	3	1642	G
50	3	1643	A
50	3	1644	A
50	3	1648	A
50	3	1650	A
50	3	1651	C
50	3	1652	A
50	3	1656	A
50	3	1668	G
50	3	1677	G
50	3	1679	U
50	3	1680	A
50	3	1681	G
50	3	1682	C
50	3	1687	G
50	3	1688	A
50	3	1694	A
50	3	1695	G
50	3	1698	A
50	3	1702	A
50	3	1703	A
50	3	1704	C
50	3	1706	C
50	3	1707	U
50	3	1708	G
50	3	1713	U
50	3	1716	A
50	3	1727	U
50	3	1748	U
50	3	1751	A
50	3	1758	C

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	1761	C
50	3	1762	A
50	3	1763	G
50	3	1764	U
50	3	1765	G
50	3	1766	A
50	3	1768	G
50	3	1769	A
50	3	1770	A
50	3	1771	C
50	3	1772	G
50	3	1777	G
50	3	1778	G
50	3	1780	A
50	3	1783	G
50	3	1784	U
50	3	1789	C
50	3	1790	U
50	3	1791	A
50	3	1794	A
50	3	1807	C
50	3	1808	C
50	3	1809	A
50	3	1815	U
50	3	1816	A
50	3	1821	G
50	3	1822	A
50	3	1823	U
50	3	1826	A
50	3	1828	A
50	3	1831	G
50	3	1832	G
50	3	1836	A
50	3	1837	C
50	3	1842	G
50	3	1855	A
50	3	1856	G
50	3	1864	A
50	3	1871	U
50	3	1873	A
50	3	1876	G
50	3	1889	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	1890	U
50	3	1891	A
50	3	1892	A
50	3	1896	A
50	3	1907	A
50	3	1908	A
50	3	1910	G
50	3	1913	G
50	3	1920	A
50	3	1921	C
50	3	1934	A
50	3	1936	G
50	3	1937	G
50	3	1938	U
50	3	1942	G
50	3	1943	A
50	3	1944	A
50	3	1948	C
50	3	1949	C
50	3	1950	U
50	3	1952	G
50	3	1953	U
50	3	1959	A
50	3	1962	U
50	3	1966	G
50	3	1968	C
50	3	1969	C
50	3	1971	G
50	3	1972	C
50	3	1974	U
50	3	1977	A
50	3	1978	U
50	3	1979	G
50	3	1980	G
50	3	1988	A
50	3	1998	U
50	3	2000	U
50	3	2004	G
50	3	2009	U
50	3	2011	G
50	3	2013	C
50	3	2020	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	2022	A
50	3	2027	G
50	3	2028	G
50	3	2030	A
50	3	2032	G
50	3	2037	A
50	3	2038	A
50	3	2040	A
50	3	2041	C
50	3	2043	C
50	3	2044	C
50	3	2050	G
50	3	2053	G
50	3	2056	A
50	3	2057	C
50	3	2062	C
50	3	2063	G
50	3	2064	G
50	3	2067	A
50	3	2068	G
50	3	2069	A
50	3	2070	C
50	3	2071	C
50	3	2072	C
50	3	2075	U
50	3	2076	G
50	3	2079	G
50	3	2083	U
50	3	2084	A
50	3	2087	G
50	3	2088	U
50	3	2099	U
50	3	2100	G
50	3	2106	G
50	3	2107	A
50	3	2108	C
50	3	2110	U
50	3	2111	U
50	3	2112	A
50	3	2114	C
50	3	2115	A
50	3	2117	G

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	2123	A
50	3	2124	A
50	3	2126	A
50	3	2127	G
50	3	2130	A
50	3	2132	G
50	3	2133	A
50	3	2138	U
50	3	2139	C
50	3	2140	G
50	3	2144	C
50	3	2145	A
50	3	2157	A
50	3	2161	G
50	3	2164	G
50	3	2165	A
50	3	2166	U
50	3	2170	A
50	3	2171	A
50	3	2173	G
50	3	2180	U
50	3	2181	A
50	3	2182	C
50	3	2184	A
50	3	2193	U
50	3	2194	G
50	3	2195	U
50	3	2198	G
50	3	2199	C
50	3	2200	U
50	3	2202	U
50	3	2204	C
50	3	2205	U
50	3	2206	A
50	3	2211	G
50	3	2212	U
50	3	2219	U
50	3	2220	A
50	3	2222	C
50	3	2228	U
50	3	2229	C
50	3	2231	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	2233	A
50	3	2238	G
50	3	2244	U
50	3	2246	G
50	3	2247	G
50	3	2251	U
50	3	2258	G
50	3	2259	G
50	3	2266	C
50	3	2267	G
50	3	2274	A
50	3	2275	A
50	3	2276	A
50	3	2277	A
50	3	2286	A
50	3	2291	U
50	3	2295	A
50	3	2297	G
50	3	2298	G
50	3	2299	U
50	3	2305	C
50	3	2312	G
50	3	2313	U
50	3	2316	G
50	3	2317	A
50	3	2318	A
50	3	2320	U
50	3	2327	U
50	3	2328	A
50	3	2329	G
50	3	2331	G
50	3	2333	G
50	3	2334	U
50	3	2335	A
50	3	2341	G
50	3	2342	U
50	3	2343	A
50	3	2344	A
50	3	2353	G
50	3	2354	A
50	3	2355	C
50	3	2358	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	2362	A
50	3	2365	U
50	3	2366	A
50	3	2374	A
50	3	2377	A
50	3	2380	U
50	3	2381	G
50	3	2387	U
50	3	2391	G
50	3	2393	C
50	3	2396	A
50	3	2397	G
50	3	2398	U
50	3	2410	C
50	3	2411	C
50	3	2414	U
50	3	2415	A
50	3	2417	G
50	3	2422	G
50	3	2431	U
50	3	2433	A
50	3	2434	A
50	3	2435	C
50	3	2436	G
50	3	2438	A
50	3	2439	U
50	3	2442	A
50	3	2443	A
50	3	2447	A
50	3	2449	U
50	3	2452	G
50	3	2456	A
50	3	2457	U
50	3	2458	A
50	3	2460	C
50	3	2461	A
50	3	2469	A
50	3	2474	C
50	3	2484	A
50	3	2486	A
50	3	2488	C
50	3	2490	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	2492	G
50	3	2499	U
50	3	2505	A
50	3	2506	C
50	3	2507	C
50	3	2509	C
50	3	2510	G
50	3	2511	A
50	3	2513	G
50	3	2515	C
50	3	2517	A
50	3	2521	A
50	3	2526	A
50	3	2527	U
50	3	2528	C
50	3	2538	A
50	3	2541	C
50	3	2543	G
50	3	2544	G
50	3	2555	U
50	3	2558	G
50	3	2563	U
50	3	2564	C
50	3	2565	G
50	3	2569	A
50	3	2572	A
50	3	2574	A
50	3	2575	G
50	3	2577	G
50	3	2578	A
50	3	2580	A
50	3	2581	C
50	3	2586	G
50	3	2590	G
50	3	2591	G
50	3	2593	U
50	3	2594	C
50	3	2604	U
50	3	2605	G
50	3	2610	A
50	3	2611	G
50	3	2614	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	2617	U
50	3	2618	C
50	3	2619	C
50	3	2621	U
50	3	2622	A
50	3	2623	U
50	3	2626	A
50	3	2627	U
50	3	2628	U
50	3	2629	G
50	3	2637	A
50	3	2638	G
50	3	2644	U
50	3	2645	U
50	3	2649	G
50	3	2653	G
50	3	2654	U
50	3	2664	U
50	3	2668	A
50	3	2669	G
50	3	2681	G
50	3	2682	A
50	3	2693	U
50	3	2697	C
50	3	2698	U
50	3	2699	C
50	3	2704	U
50	3	2708	G
50	3	2710	G
50	3	2721	C
50	3	2722	G
50	3	2726	G
50	3	2728	U
50	3	2732	A
50	3	2733	A
50	3	2735	G
50	3	2737	G
50	3	2740	U
50	3	2741	A
50	3	2747	U
50	3	2751	C
50	3	2752	G

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	2753	C
50	3	2756	A
50	3	2759	G
50	3	2765	A
50	3	2772	A
50	3	2773	A
50	3	2774	A
50	3	2785	G
50	3	2786	A
50	3	2788	U
50	3	2790	A
50	3	2798	A
50	3	2799	U
50	3	2804	C
50	3	2807	G
50	3	2808	A
50	3	2809	A
50	3	2811	G
50	3	2812	U
50	3	2813	A
50	3	2814	A
50	3	2815	G
50	3	2822	C
50	3	2824	A
50	3	2828	C
50	3	2829	G
50	3	2830	A
50	3	2837	U
50	3	2839	A
50	3	2840	U
50	3	2850	G
50	3	2851	U
50	3	2852	G
50	3	2853	U
50	3	2862	U
50	3	2863	G
50	3	2865	U
50	3	2871	G
50	3	2876	G
50	3	2878	G
50	3	2883	A
50	3	2884	C

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	2888	U
50	3	2889	U
50	3	2890	G
50	3	2896	G
50	3	2897	G
50	3	2898	A
50	3	2899	C
51	4	8	C
51	4	9	C
51	4	10	C
51	4	11	A
51	4	14	U
51	4	22	G
51	4	23	A
51	4	27	A
51	4	28	C
51	4	31	G
51	4	32	G
51	4	33	U
51	4	35	C
51	4	38	U
51	4	39	U
51	4	40	U
51	4	41	C
51	4	42	G
51	4	43	A
51	4	47	C
51	4	48	A
51	4	49	G
51	4	50	C
51	4	51	A
51	4	54	U
51	4	55	A
51	4	60	C
51	4	66	A
51	4	77	G
51	4	78	C
51	4	80	G
51	4	88	G
51	4	89	A
51	4	92	A
51	4	98	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
51	4	99	A
51	4	100	G
51	4	101	C
51	4	102	A
51	4	106	A
51	4	107	G
51	4	108	C
52	5	7	U
52	5	8	G
52	5	10	G
52	5	29	G
52	5	32	U
52	5	36	G
52	5	45	A
52	5	48	C
52	5	49	C
52	5	51	A
52	5	52	A
52	5	53	U
52	5	58	G
52	5	66	A
52	5	71	A
52	5	75	A
52	5	83	U
52	5	86	A
52	5	94	A
52	5	106	C
52	5	114	C
52	5	115	A
52	5	117	U
52	5	121	C
52	5	130	G
52	5	132	G
52	5	149	G
52	5	152	U
52	5	156	U
52	5	159	U
52	5	160	A
52	5	162	C
52	5	167	A
52	5	169	G
52	5	171	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
52	5	180	C
52	5	187	A
52	5	196	G
52	5	197	A
52	5	199	A
52	5	214	U
52	5	218	U
52	5	220	U
52	5	223	G
52	5	229	G
52	5	232	G
52	5	235	C
52	5	241	C
52	5	242	A
52	5	243	G
52	5	246	A
52	5	247	G
52	5	249	U
52	5	256	G
52	5	258	A
52	5	259	A
52	5	260	C
52	5	262	G
52	5	263	C
52	5	272	G
52	5	276	U
52	5	277	G
52	5	279	C
52	5	285	G
52	5	294	A
52	5	301	G
52	5	311	A
52	5	312	A
52	5	323	A
52	5	324	C
52	5	325	A
52	5	326	C
52	5	327	G
52	5	328	G
52	5	330	C
52	5	335	C
52	5	341	C

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
52	5	342	G
52	5	344	G
52	5	347	G
52	5	348	C
52	5	349	A
52	5	350	G
52	5	357	G
52	5	363	U
52	5	364	U
52	5	365	U
52	5	369	A
52	5	373	A
52	5	375	C
52	5	376	G
52	5	377	A
52	5	378	A
52	5	384	G
52	5	386	U
52	5	393	A
52	5	400	G
52	5	401	U
52	5	402	G
52	5	407	A
52	5	408	U
52	5	409	G
52	5	410	A
52	5	414	U
52	5	417	U
52	5	418	U
52	5	419	A
52	5	420	A
52	5	421	G
52	5	424	U
52	5	425	G
52	5	426	U
52	5	427	A
52	5	431	U
52	5	436	U
52	5	438	A
52	5	439	U
52	5	449	A
52	5	450	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
52	5	452	A
52	5	453	C
52	5	456	U
52	5	457	A
52	5	461	G
52	5	464	A
52	5	469	C
52	5	471	A
52	5	473	A
52	5	476	U
52	5	477	U
52	5	478	G
52	5	481	U
52	5	482	G
52	5	483	U
52	5	484	A
52	5	487	A
52	5	488	U
52	5	489	U
52	5	493	A
52	5	494	A
52	5	495	U
52	5	497	A
52	5	504	A
52	5	507	A
52	5	509	C
52	5	510	U
52	5	511	A
52	5	516	C
52	5	517	C
52	5	519	G
52	5	525	G
52	5	527	G
52	5	528	G
52	5	529	U
52	5	530	A
52	5	531	A
52	5	532	U
52	5	534	C
52	5	545	A
52	5	553	C
52	5	557	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
52	5	558	U
52	5	559	U
52	5	560	U
52	5	562	U
52	5	565	G
52	5	568	G
52	5	569	U
52	5	570	A
52	5	573	G
52	5	574	C
52	5	575	A
52	5	580	C
52	5	586	G
52	5	594	A
52	5	595	G
52	5	605	A
52	5	609	G
52	5	612	G
52	5	617	U
52	5	619	A
52	5	621	C
52	5	628	A
52	5	635	G
52	5	637	A
52	5	638	A
52	5	641	U
52	5	644	U
52	5	650	A
52	5	653	G
52	5	662	G
52	5	663	G
52	5	667	U
52	5	668	U
52	5	672	A
52	5	680	G
52	5	682	G
52	5	683	G
52	5	684	A
52	5	690	G
52	5	692	A
52	5	693	A
52	5	697	G

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
52	5	699	A
52	5	700	G
52	5	701	A
52	5	715	A
52	5	718	A
52	5	719	G
52	5	720	U
52	5	721	G
52	5	731	A
52	5	732	A
52	5	740	G
52	5	745	U
52	5	746	A
52	5	749	G
52	5	750	A
52	5	752	G
52	5	756	A
52	5	770	G
52	5	775	G
52	5	778	A
52	5	789	A
52	5	790	U
52	5	796	A
52	5	798	U
52	5	806	A
52	5	809	G
52	5	810	U
52	5	812	A
52	5	814	C
52	5	815	G
52	5	816	A
52	5	817	U
52	5	818	A
52	5	822	A
52	5	825	A
52	5	829	G
52	5	838	A
52	5	846	G
52	5	849	A
52	5	855	G
52	5	866	A
52	5	870	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
52	5	882	U
52	5	883	A
52	5	885	U
52	5	887	C
52	5	896	G
52	5	906	C
52	5	907	A
52	5	908	A
52	5	909	A
52	5	910	C
52	5	911	G
52	5	917	G
52	5	918	A
52	5	920	G
52	5	921	G
52	5	922	G
52	5	929	C
52	5	930	A
52	5	934	G
52	5	937	G
52	5	953	A
52	5	955	U
52	5	956	U
52	5	961	G
52	5	964	A
52	5	965	C
52	5	966	A
52	5	970	A
52	5	971	A
52	5	972	A
52	5	975	C
52	5	976	U
52	5	977	U
52	5	987	U
52	5	988	G
52	5	989	A
52	5	991	A
52	5	997	G
52	5	999	C
52	5	1000	A
52	5	1003	G
52	5	1008	G

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
52	5	1009	G
52	5	1012	A
52	5	1014	A
52	5	1015	U
52	5	1017	A
52	5	1036	C
52	5	1037	A
52	5	1042	G
52	5	1044	G
52	5	1045	C
52	5	1046	A
52	5	1047	U
52	5	1053	U
52	5	1055	G
52	5	1056	U
52	5	1057	C
52	5	1061	U
52	5	1071	A
52	5	1072	G
52	5	1076	U
52	5	1077	U
52	5	1079	G
52	5	1084	A
52	5	1085	G
52	5	1086	U
52	5	1088	C
52	5	1092	A
52	5	1095	G
52	5	1099	G
52	5	1102	A
52	5	1113	U
52	5	1115	G
52	5	1118	A
52	5	1121	U
52	5	1122	U
52	5	1123	G
52	5	1128	G
52	5	1130	G
52	5	1134	C
52	5	1135	U
52	5	1136	G
52	5	1141	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
52	5	1151	A
52	5	1158	A
52	5	1159	A
52	5	1162	G
52	5	1163	A
52	5	1165	G
52	5	1166	A
52	5	1169	U
52	5	1171	A
52	5	1172	A
52	5	1173	A
52	5	1176	A
52	5	1179	A
52	5	1187	U
52	5	1188	A
52	5	1189	U
52	5	1192	C
52	5	1199	U
52	5	1200	G
52	5	1201	C
52	5	1203	A
52	5	1208	G
52	5	1211	A
52	5	1215	U
52	5	1216	G
52	5	1217	G
52	5	1223	A
52	5	1225	A
52	5	1232	C
52	5	1233	G
52	5	1235	C
52	5	1243	A
52	5	1244	A
52	5	1245	A
52	5	1255	A
52	5	1260	U
52	5	1261	A
52	5	1263	A
52	5	1265	U
52	5	1271	U
52	5	1276	U
52	5	1279	G

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
52	5	1287	G
52	5	1291	C
52	5	1294	U
52	5	1296	C
52	5	1297	G
52	5	1301	U
52	5	1306	A
52	5	1310	C
52	5	1312	G
52	5	1320	A
52	5	1322	U
52	5	1327	G
52	5	1328	C
52	5	1338	A
52	5	1343	G
52	5	1354	G
52	5	1356	U
52	5	1358	U
52	5	1359	C
52	5	1369	A
52	5	1374	C
52	5	1375	C
52	5	1379	C
52	5	1381	U
52	5	1383	A
52	5	1397	G
52	5	1400	A
52	5	1404	U
52	5	1407	A
52	5	1408	A
52	5	1411	A
52	5	1415	G
52	5	1417	U
52	5	1421	A
52	5	1422	A
52	5	1423	C
52	5	1427	U
52	5	1429	G
52	5	1431	A
52	5	1433	G
52	5	1446	A
52	5	1451	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
52	5	1466	U
52	5	1467	A
52	5	1468	A
52	5	1469	G
52	5	1474	A
52	5	1478	A
52	5	1480	G
52	5	1482	A
52	5	1493	A
52	5	1495	C
52	5	1504	G
52	5	1505	G
52	5	1506	A
52	5	1507	U
53	7	3	G
53	7	4	U
53	7	9	U
53	7	11	G
53	7	13	U
53	7	17	U
53	7	18	C
53	7	19	G
53	7	20	G
53	7	21	U
53	7	22	A
53	7	24	A
53	7	28	A
53	7	35	G
53	7	36	A
53	7	37	A
53	7	43	G
53	7	44	U
53	7	46	U
53	7	47	G
53	7	48	U
53	7	49	C
53	7	50	G
53	7	54	G
53	7	56	U
53	7	57	C
53	7	58	G
53	7	62	C

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
53	7	72	C
53	7	74	A
53	7	75	C
53	7	76	C
53	8	3	G
53	8	4	U
53	8	9	U
53	8	11	G
53	8	13	U
53	8	17	U
53	8	18	C
53	8	19	G
53	8	20	G
53	8	21	U
53	8	22	A
53	8	24	A
53	8	28	A
53	8	35	G
53	8	36	A
53	8	37	A
53	8	43	G
53	8	44	U
53	8	46	U
53	8	47	G
53	8	48	U
53	8	49	C
53	8	50	G
53	8	54	G
53	8	56	U
53	8	57	C
53	8	58	G
53	8	62	C
53	8	72	C
53	8	74	A
53	8	75	C
53	8	76	C

All (54) RNA pucker outliers are listed below:

<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	180	A
50	3	296	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
50	3	311	G
50	3	315	A
50	3	402	A
50	3	410	G
50	3	425	U
50	3	500	U
50	3	508	A
50	3	513	A
50	3	648	G
50	3	688	U
50	3	881	A
50	3	932	U
50	3	952	U
50	3	1048	A
50	3	1143	U
50	3	1209	U
50	3	1216	U
50	3	1507	G
50	3	1512	A
50	3	1583	G
50	3	1585	A
50	3	1587	U
50	3	1588	A
50	3	1820	U
50	3	1872	U
50	3	1919	A
50	3	2164	G
50	3	2180	U
50	3	2342	U
50	3	2386	A
50	3	2395	U
50	3	2504	C
50	3	2506	C
50	3	2562	U
50	3	2604	U
50	3	2668	A
50	3	2764	U
50	3	2862	U
50	3	2897	G
51	4	10	C
51	4	54	U
51	4	59	A

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Mol	Chain	Res	Type
52	5	31	U
52	5	408	U
52	5	975	C
52	5	1087	C
52	5	1133	A
52	5	1158	A
53	7	57	C
53	7	74	A
53	8	57	C
53	8	74	A

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

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

#### 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

#### 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

#### 5.7 Other polymers [i](#)

There are no such residues in this entry.

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

There are no chain breaks in this entry.

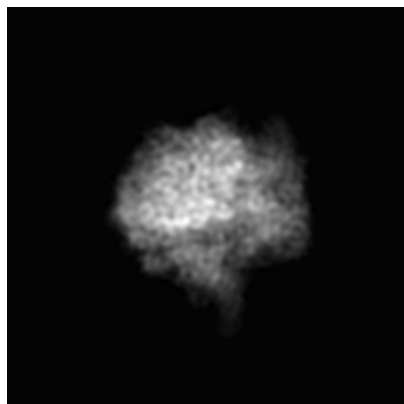
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-13272. These allow visual inspection of the internal detail of the map and identification of artifacts.

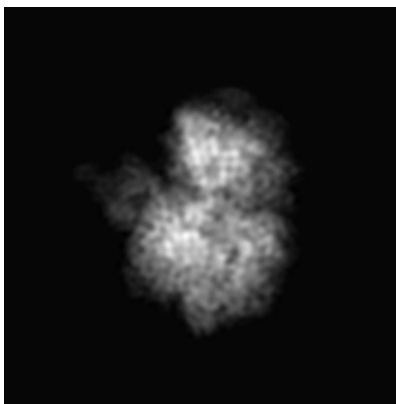
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

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

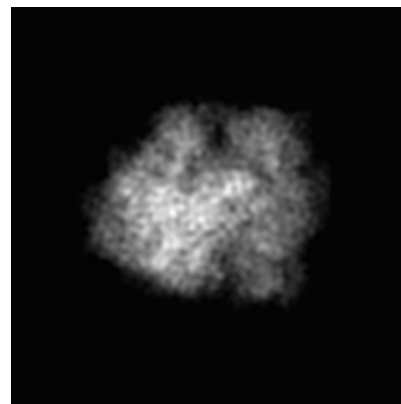
#### 6.1.1 Primary map



X

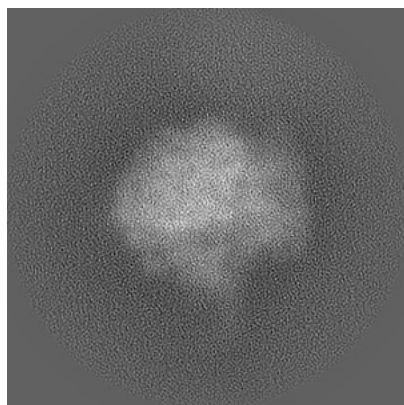


Y

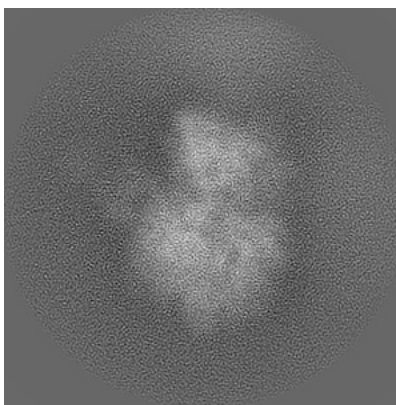


Z

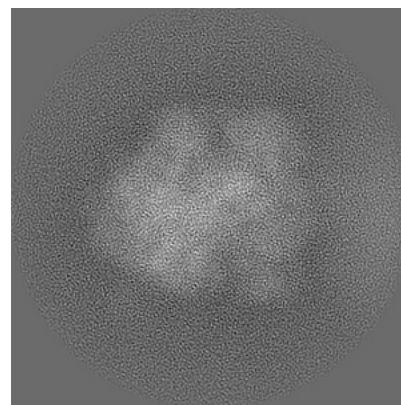
#### 6.1.2 Raw map



X



Y

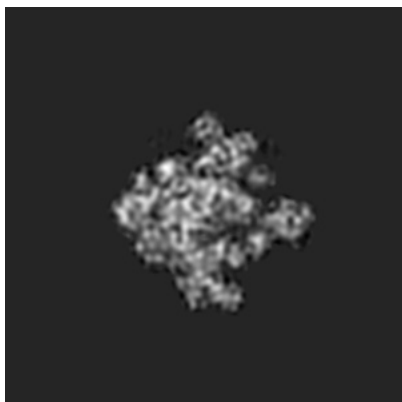


Z

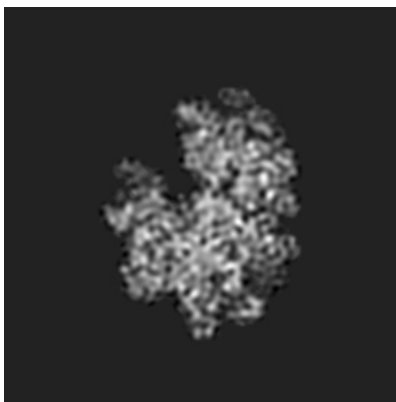
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

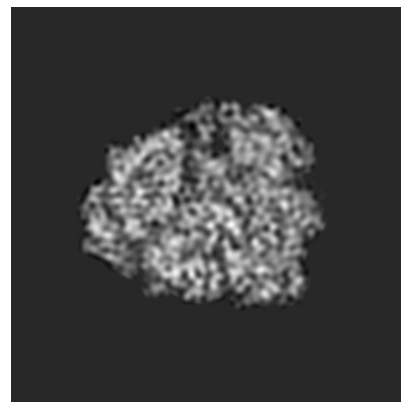
### 6.2.1 Primary map



X Index: 128

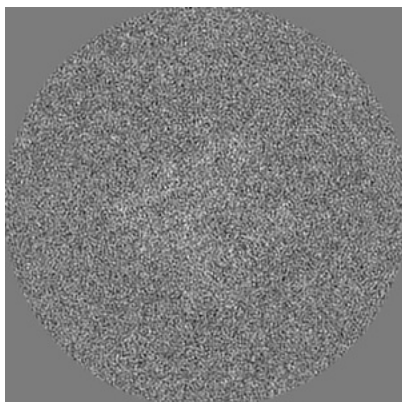


Y Index: 128

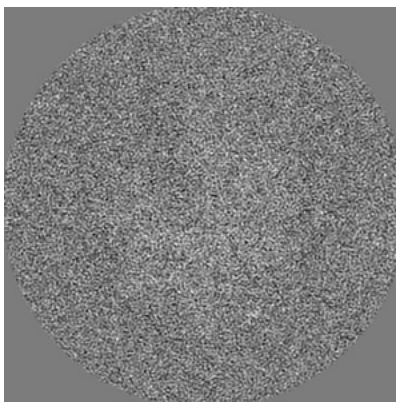


Z Index: 128

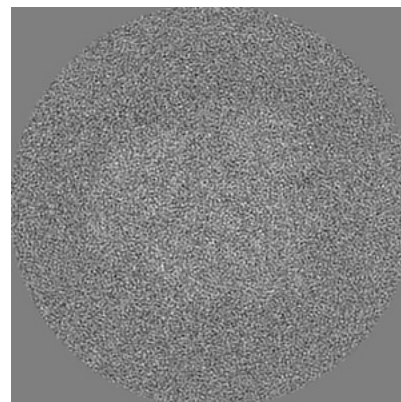
### 6.2.2 Raw map



X Index: 128



Y Index: 128

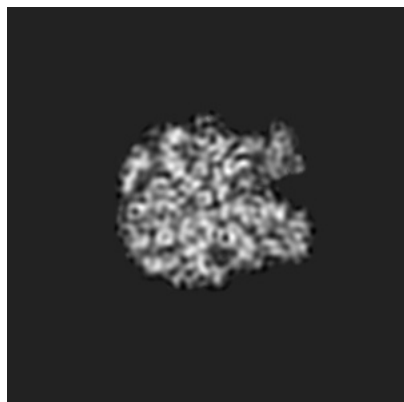


Z Index: 128

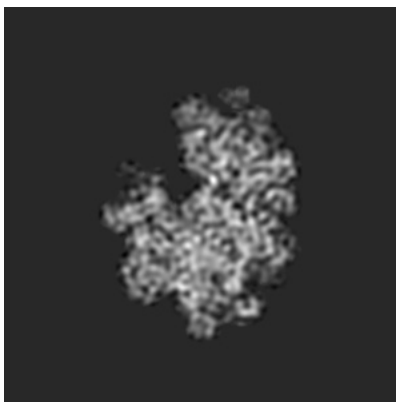
The images above show central slices of the map in three orthogonal directions.

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

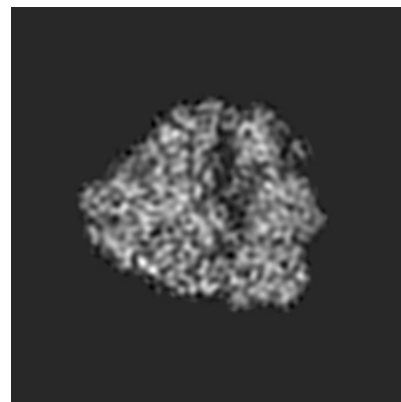
### 6.3.1 Primary map



X Index: 104

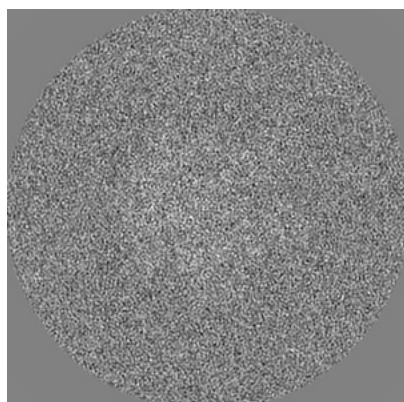


Y Index: 126

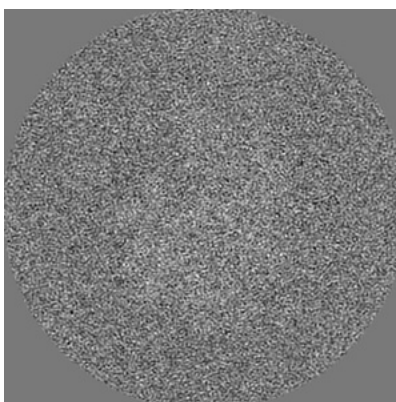


Z Index: 122

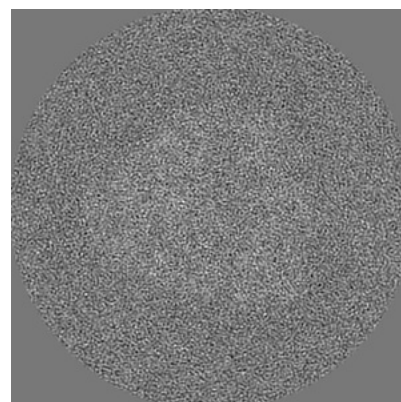
### 6.3.2 Raw map



X Index: 121



Y Index: 123



Z Index: 123

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

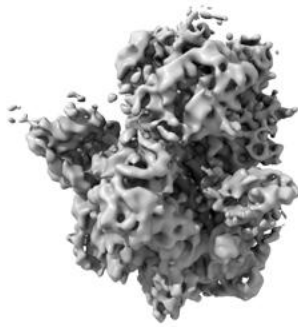


## 6.4 Orthogonal surface views [i](#)

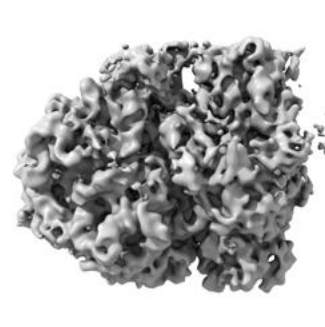
### 6.4.1 Primary map



X



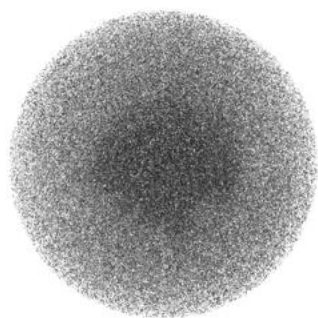
Y



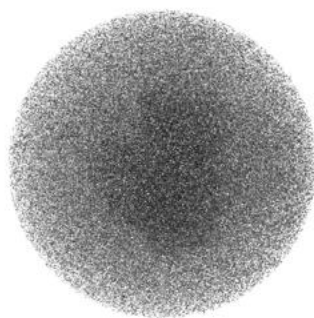
Z

The images above show the 3D surface view of the map at the recommended contour level 0.47. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

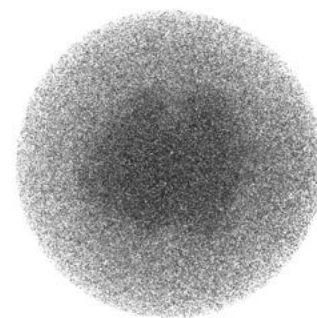
### 6.4.2 Raw map



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.

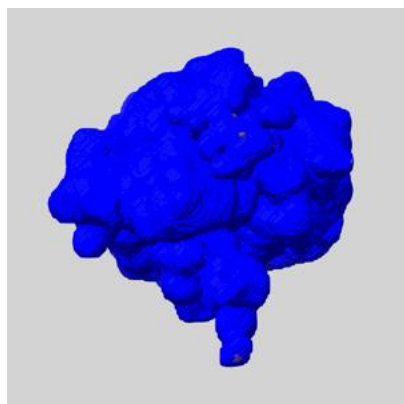
## 6.5 Mask visualisation [i](#)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

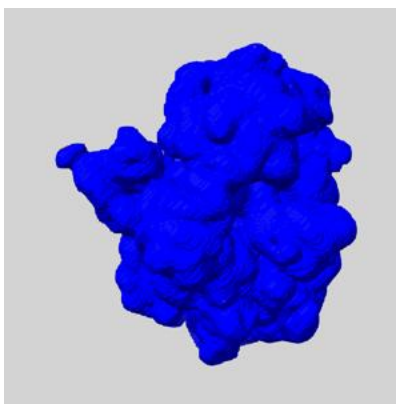
A mask typically either:

- Encompasses the whole structure
- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

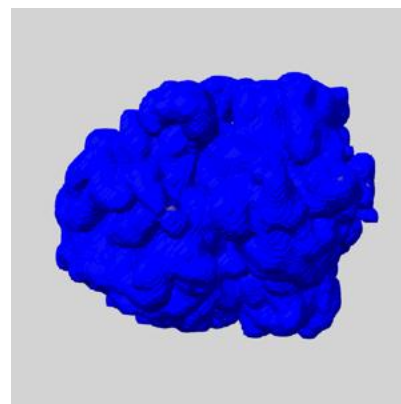
### 6.5.1 emd\_13272\_msk\_1.map [i](#)



X



Y



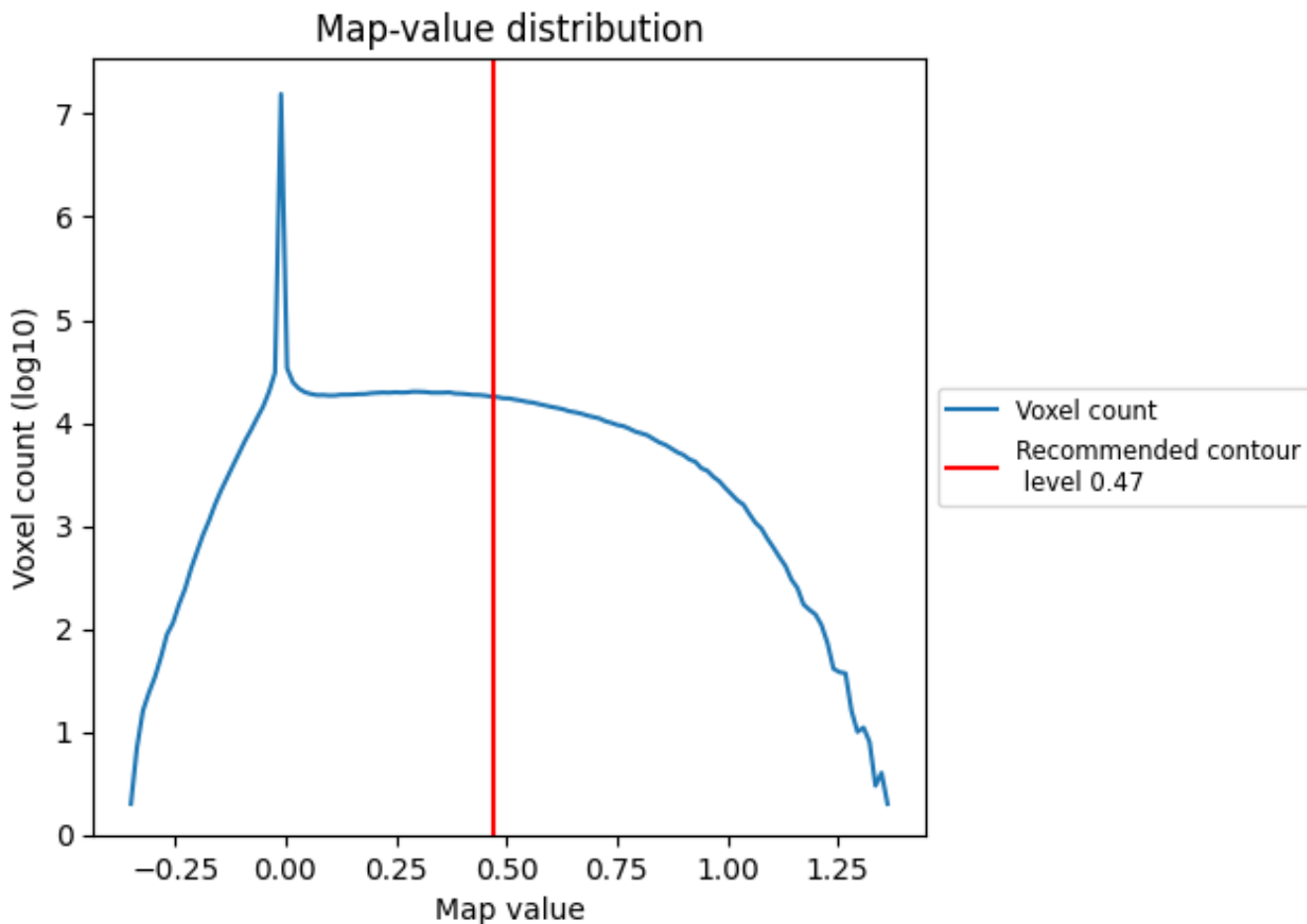
Z



## 7 Map analysis [i](#)

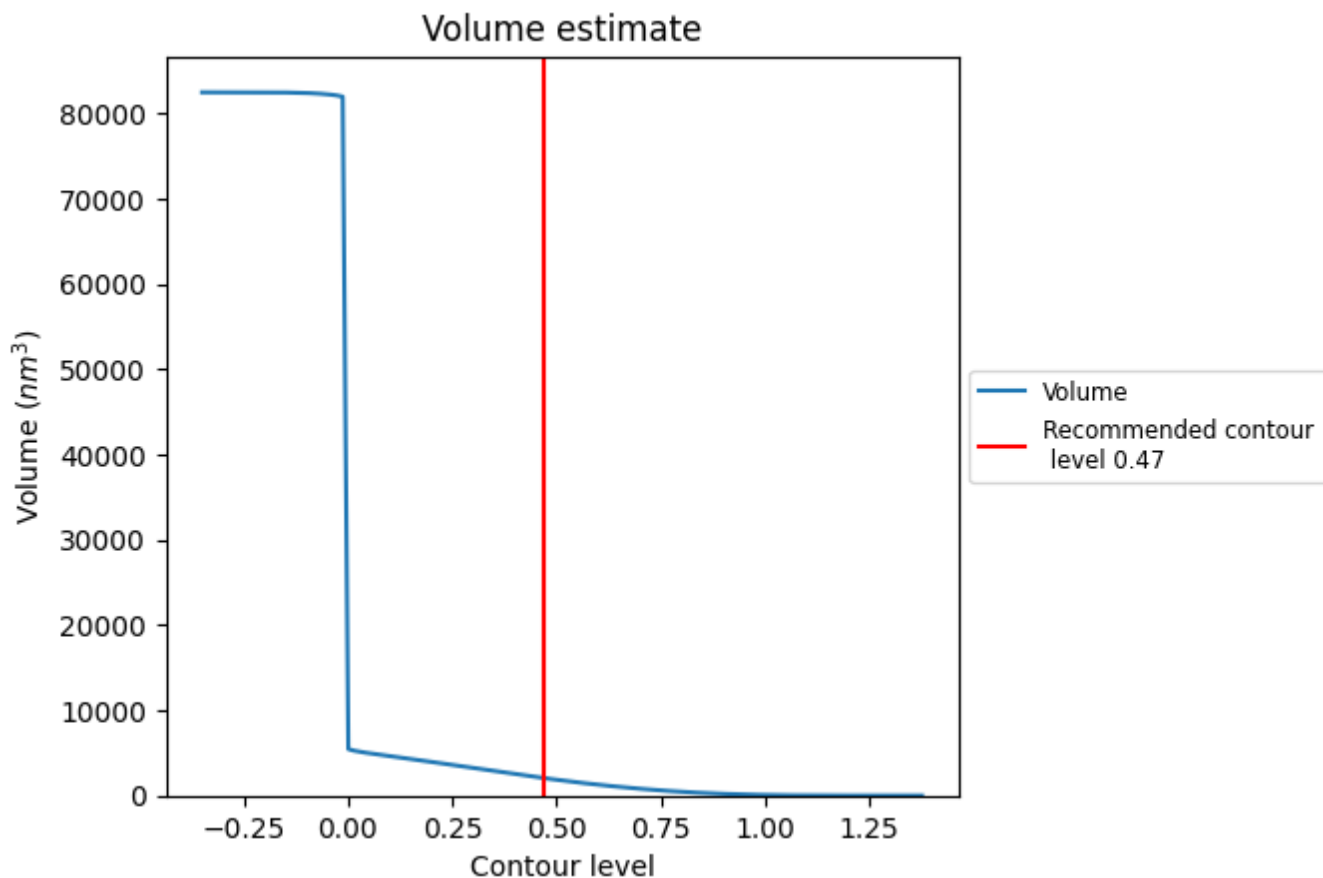
This section contains the results of statistical analysis of the map.

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



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

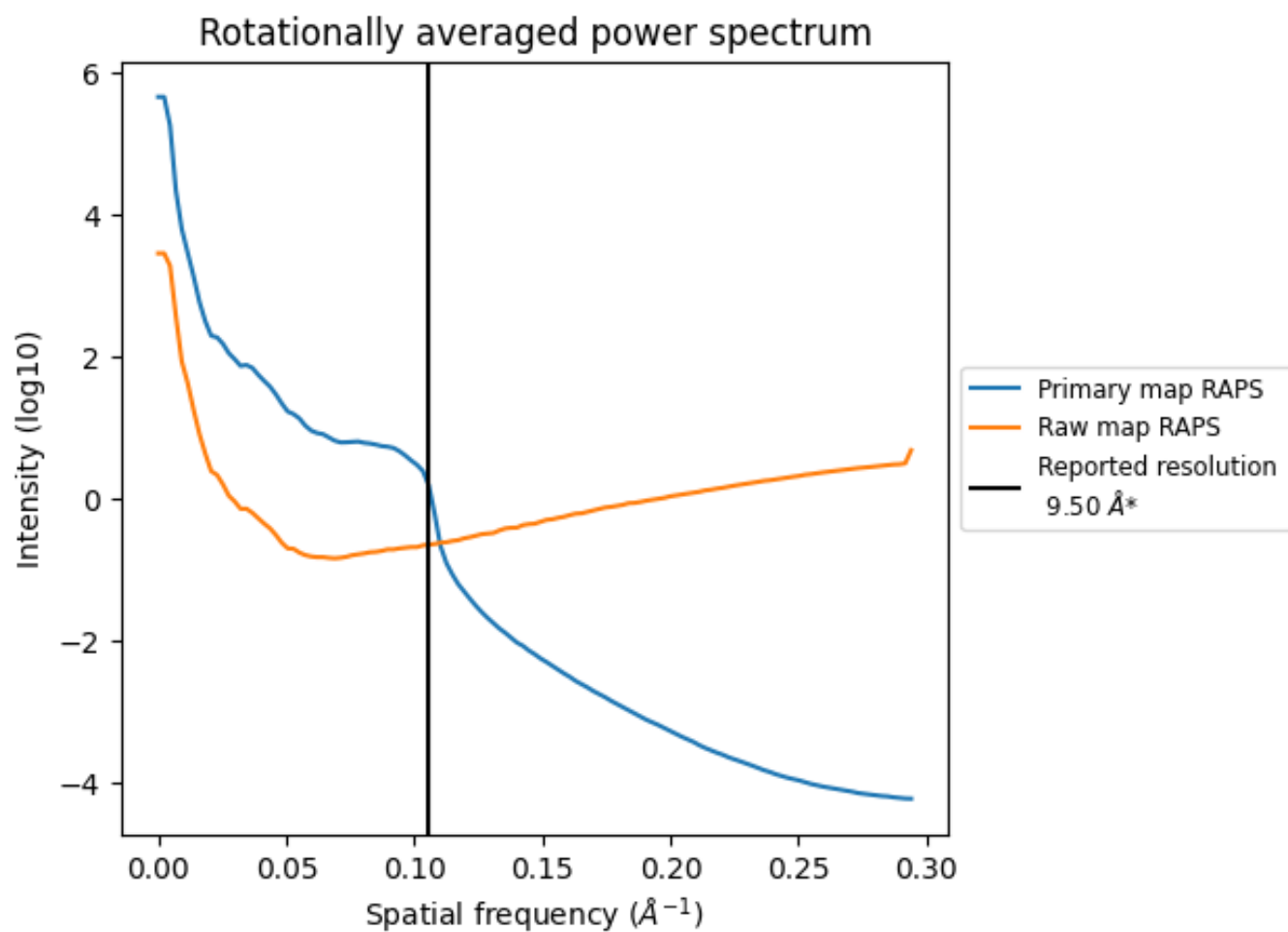
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 2047  $\text{nm}^3$ ; this corresponds to an approximate mass of 1849 kDa.

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

### 7.3 Rotationally averaged power spectrum i

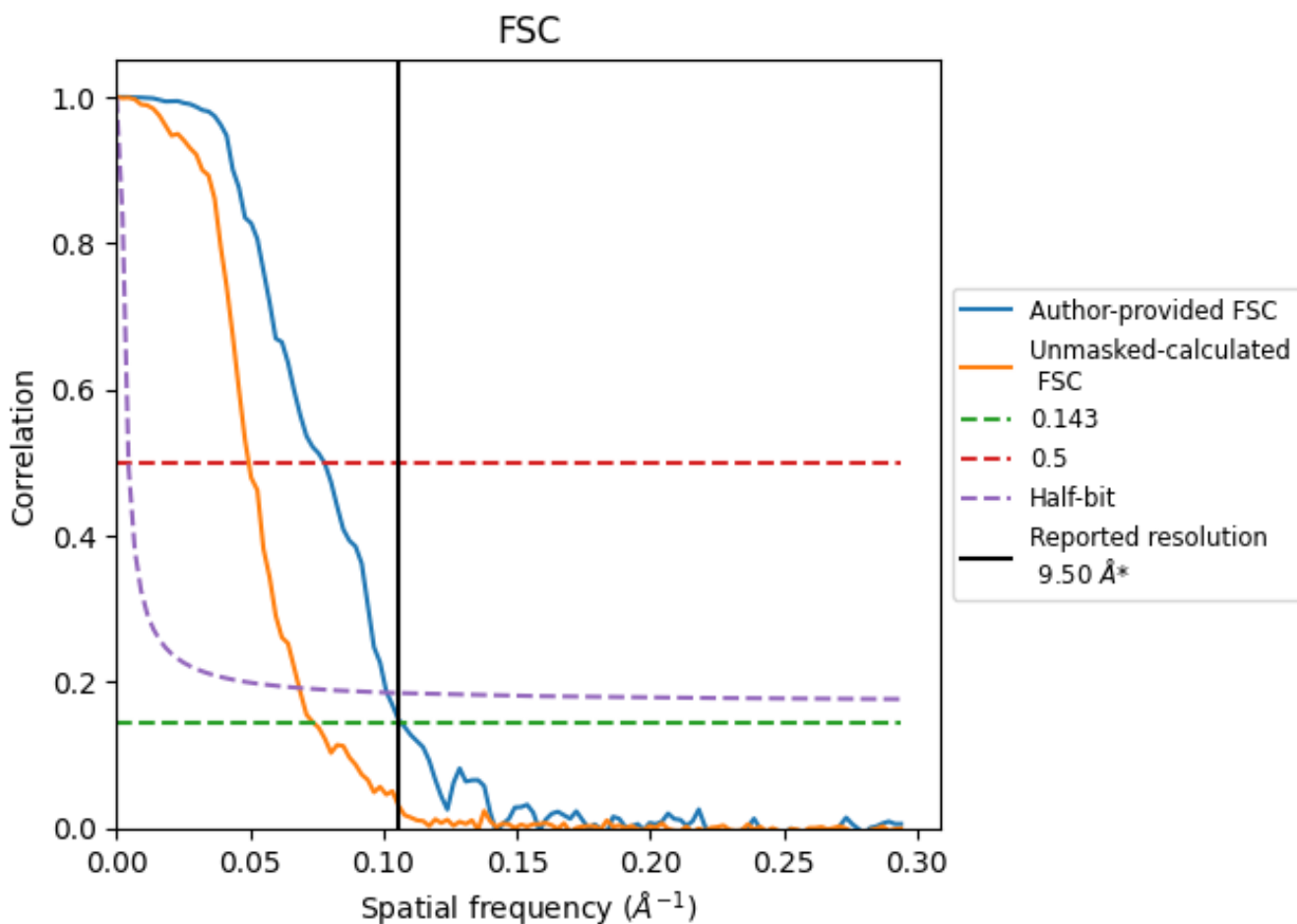


\*Reported resolution corresponds to spatial frequency of 0.105 Å<sup>-1</sup>

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

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

### 8.1 FSC [i](#)



\*Reported resolution corresponds to spatial frequency of 0.105 Å<sup>-1</sup>

## 8.2 Resolution estimates [i](#)

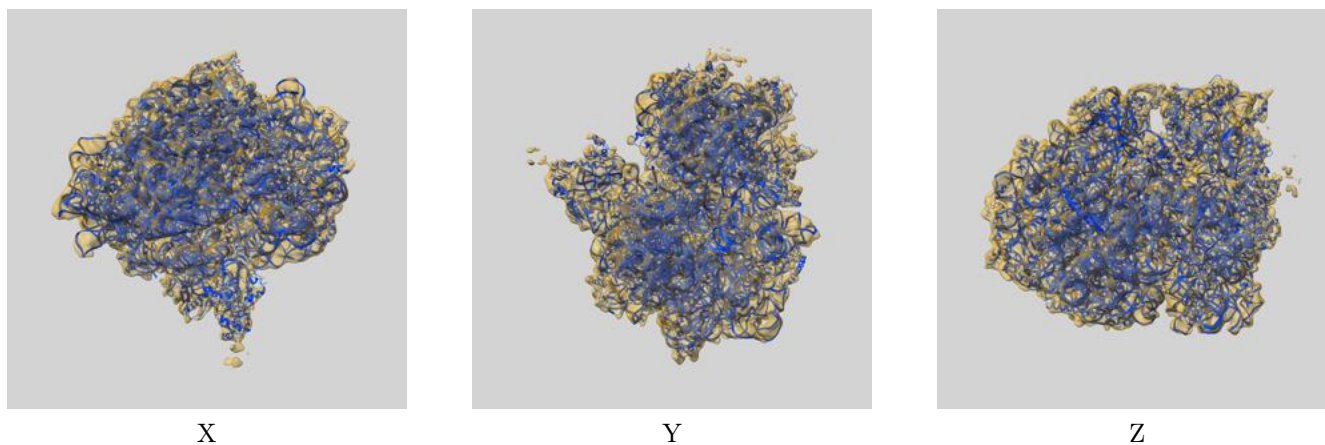
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	9.50	-	-
Author-provided FSC curve	9.36	12.85	9.87
Unmasked-calculated*	13.51	20.16	14.60

\*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 13.51 differs from the reported value 9.5 by more than 10 %

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

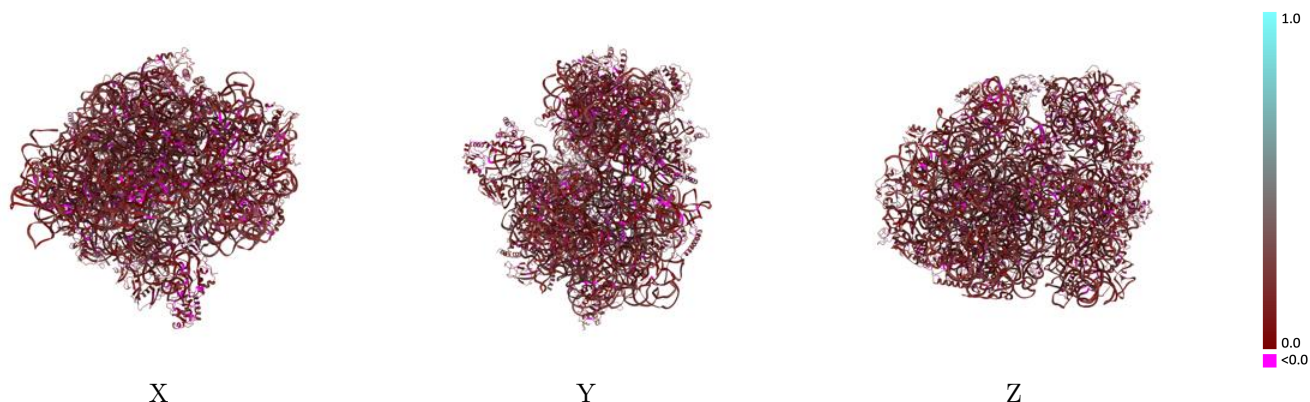
This section contains information regarding the fit between EMDB map EMD-13272 and PDB model 7PAH. Per-residue inclusion information can be found in section 3 on page 13.

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



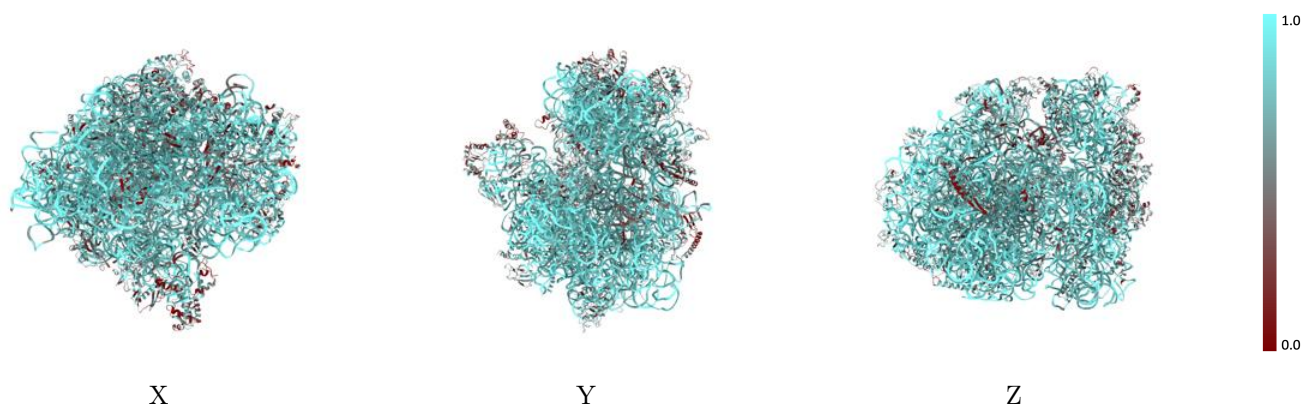
The images above show the 3D surface view of the map at the recommended contour level 0.47 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



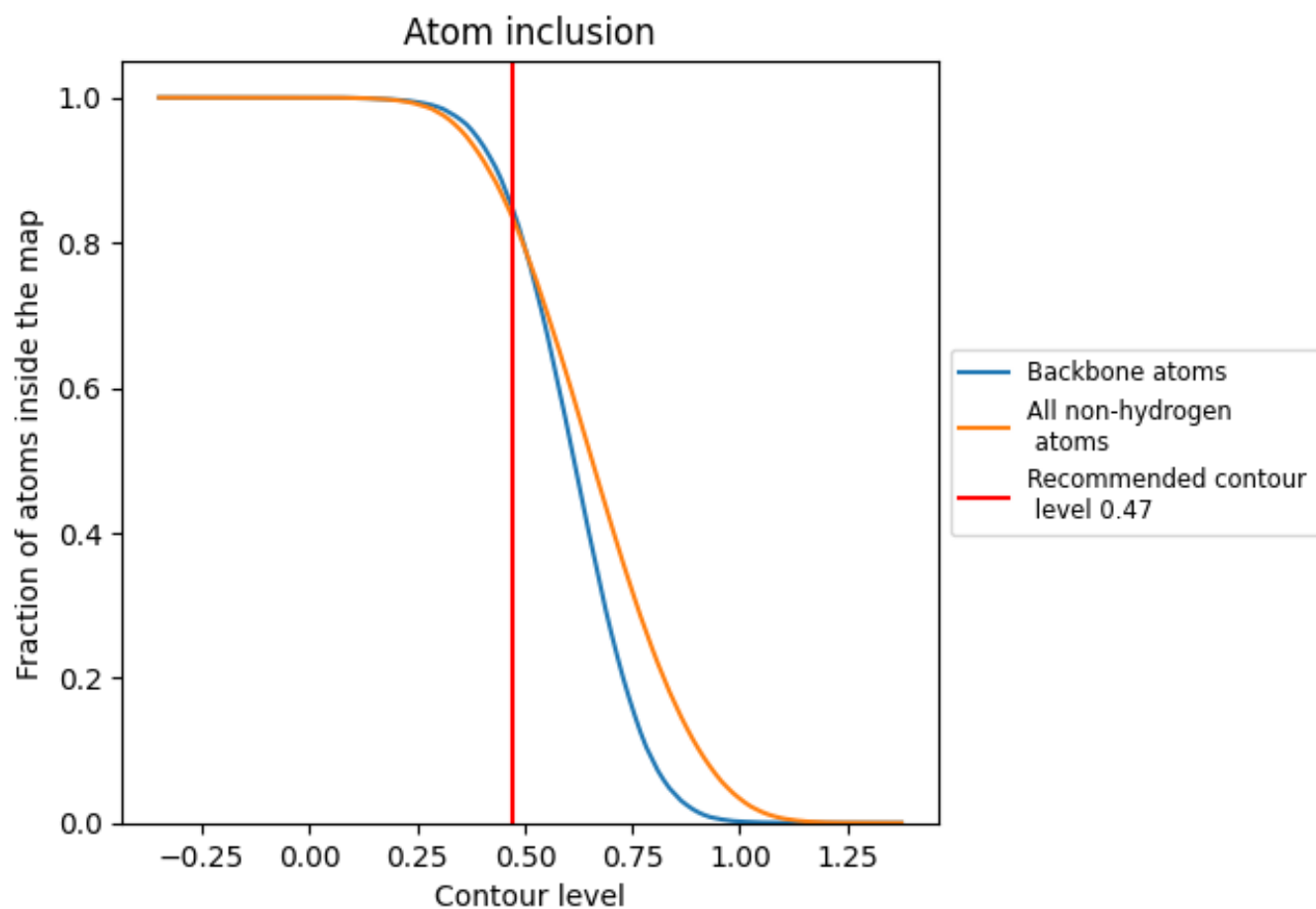
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

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



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.47).

## 9.4 Atom inclusion [i](#)








































































At the recommended contour level, 85% of all backbone atoms, 84% 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 (0.47) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8371	 0.1540
0	 0.8000	 0.1280
1	 0.6824	 0.0980
2	 0.6926	 0.0720
3	 0.9488	 0.1660
4	 0.9576	 0.1780
5	 0.9397	 0.1620
7	 0.8486	 0.1580
8	 0.4728	 0.0800
A	 0.5214	 0.1520
B	 0.5525	 0.1430
C	 0.6011	 0.1330
D	 0.5266	 0.1270
E	 0.5292	 0.1530
F	 0.6000	 0.1340
G	 0.6132	 0.1350
H	 0.6384	 0.1320
I	 0.5761	 0.1330
J	 0.6047	 0.1220
K	 0.6504	 0.1080
L	 0.5861	 0.1350
M	 0.6549	 0.0800
N	 0.6828	 0.1560
O	 0.7377	 0.1420
P	 0.5982	 0.1100
Q	 0.6880	 0.1390
R	 0.5119	 0.0960
S	 0.7557	 0.1590
T	 0.6786	 0.1810
a	 0.7020	 0.1170
b	 0.6567	 0.1230
c	 0.6794	 0.1340
d	 0.6303	 0.1310
e	 0.5654	 0.1610
f	 0.2567	 0.1390



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Chain	Atom inclusion	Q-score
g	 0.4642	 0.1110
h	 0.3626	 0.1130
i	 0.7266	 0.1430
j	 0.5717	 0.1330
k	 0.6867	 0.1260
l	 0.7213	 0.1290
m	 0.6677	 0.1350
n	 0.7647	 0.1530
o	 0.6114	 0.1440
p	 0.7705	 0.1230
q	 0.6571	 0.1280
r	 0.7512	 0.1450
s	 0.6333	 0.1510
t	 0.5738	 0.1380
u	 0.7500	 0.1070
v	 0.7434	 0.1300
w	 0.6954	 0.1770
x	 0.5452	 0.1410
y	 0.7166	 0.1110
z	 0.7481	 0.1230