



## wwPDB EM Validation Summary Report ⓘ

Sep 16, 2021 – 11:07 pm BST

PDB ID : 7OPE  
EMDB ID : EMD-13017  
Title : RqcH DR variant bound to 50S-peptidyl-tRNA-RqcP RQC complex (rigid body refinement)  
Authors : Crowe-McAuliffe, C.; Wilson, D.N.  
Deposited on : 2021-05-31  
Resolution : 3.20 Å(reported)

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

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

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

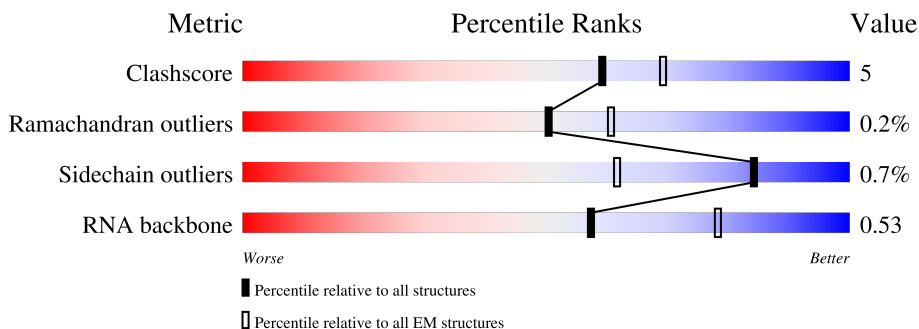
EMDB validation analysis : **FAILED**  
MolProbity : 4.02b-467  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.23.1

# 1 Overall quality at a glance i

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

The reported resolution of this entry is 3.20 Å.

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



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826
RNA backbone	4643	859

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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  $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	2926	63% 27% 6% . .
2	B	119	58% 24% 11% . 6%
3	E	277	82% 15% . .
4	F	209	86% 12% .
5	G	207	90% 9% .
6	H	179	78% 20% . .
7	I	179	83% 15% .


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Mol	Chain	Length	Quality of chain
8	K	141	82% 12% 6%
9	L	166	52% 16% 32%
10	N	145	81% 17% .
11	O	122	80% 20%
12	P	146	90% 10%
13	Q	144	81% 12% . 6%
14	R	120	80% 19% .
15	S	120	80% 19% .
16	T	115	87% 13%
17	U	119	84% 13% ..
18	V	102	88% 10% .
19	W	113	86% 11% .
20	X	95	85% 9% 5%
21	Y	103	89% 9% .
22	2	76	37% 37% 14% . 8%
23	a	94	85% . 14%
24	b	62	94% 6%
25	c	66	98% .
26	d	59	98% .
27	f	59	86% . 10%
28	g	49	98% .
29	h	44	95% 5%
30	i	66	97% .
31	j	37	100%
32	1	86	90% 7% .

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Mol	Chain	Length	Quality of chain
33	0	599	 75% 12% 11%

## 2 Entry composition

There are 33 unique types of molecules in this entry. The entry contains 93862 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 23S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
1	A	2814	60436	26962	11170	19491	2813	0	0

- Molecule 2 is a RNA chain called 5S rRNA.

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

- Molecule 3 is a protein called 50S ribosomal protein L2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	E	272	2083	1296	408	373	6	0	0

- Molecule 4 is a protein called 50S ribosomal protein L3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	F	206	1569	985	289	290	5	0	0

- Molecule 5 is a protein called 50S ribosomal protein L4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	G	205	1561	980	289	290	2	0	0

- Molecule 6 is a protein called 50S ribosomal protein L5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	H	176	1387	883	241	256	7	0	0

- Molecule 7 is a protein called 50S ribosomal protein L6.

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

- Molecule 8 is a protein called 50S ribosomal protein L11.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
8	K	132	Total	C	N	O	S	0	0
			974	612	172	184	6		

- Molecule 9 is a protein called 50S ribosomal protein L10.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	L	113	Total	C	N	O	S	0	0
			886	559	152	174	1		

- Molecule 10 is a protein called 50S ribosomal protein L13.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
10	N	142	Total	C	N	O	S	0	0
			1124	710	206	203	5		

- Molecule 11 is a protein called 50S ribosomal protein L14.

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

- Molecule 12 is a protein called 50S ribosomal protein L15.

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

- Molecule 13 is a protein called 50S ribosomal protein L16.

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

- Molecule 14 is a protein called 50S ribosomal protein L17.

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

- Molecule 15 is a protein called 50S ribosomal protein L18.

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

- Molecule 16 is a protein called 50S ribosomal protein L19.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	T	115	Total	C	N	O	S	0	0
			945	600	185	159	1		

- Molecule 17 is a protein called 50S ribosomal protein L20.

Mol	Chain	Residues	Atoms					AltConf	Trace
17	U	117	Total	C	N	O	S	0	0
			940	591	189	156	4		

- Molecule 18 is a protein called 50S ribosomal protein L21.

Mol	Chain	Residues	Atoms				AltConf	Trace
18	V	100	Total	C	N	O	0	0
			781	498	138	145		

- Molecule 19 is a protein called 50S ribosomal protein L22.

Mol	Chain	Residues	Atoms					AltConf	Trace
19	W	109	Total	C	N	O	S	0	0
			842	525	164	150	3		

- Molecule 20 is a protein called 50S ribosomal protein L23.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	X	90	Total	C	N	O	S	0	0
			725	452	134	136	3		

- Molecule 21 is a protein called 50S ribosomal protein L24.

Mol	Chain	Residues	Atoms					AltConf	Trace
21	Y	101	Total	C	N	O	S	0	0
			762	478	142	138	4		

- Molecule 22 is a RNA chain called tRNA-Ala-UGC.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	2	70	Total	C	N	O	P	0	0
			1496	666	271	489	70		

- Molecule 23 is a protein called 50S ribosomal protein L27.

Mol	Chain	Residues	Atoms				AltConf	Trace
23	a	81	Total	C	N	O	0	0
			624	387	122	115		

- Molecule 24 is a protein called 50S ribosomal protein L28.

Mol	Chain	Residues	Atoms					AltConf	Trace
24	b	58	Total	C	N	O	S	0	0
			444	275	92	75	2		

- Molecule 25 is a protein called 50S ribosomal protein L29.

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

- Molecule 26 is a protein called 50S ribosomal protein L30.

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

- Molecule 27 is a protein called 50S ribosomal protein L32.

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

- Molecule 28 is a protein called 50S ribosomal protein L33 1.



Mol	Chain	Residues	Atoms					AltConf	Trace
28	g	48	Total	C	N	O	S	0	0
			401	244	80	73	4		

- Molecule 29 is a protein called 50S ribosomal protein L34.

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

- Molecule 30 is a protein called 50S ribosomal protein L35.

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

- Molecule 31 is a protein called 50S ribosomal protein L36.

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

- Molecule 32 is a protein called Uncharacterized protein YabO.

Mol	Chain	Residues	Atoms					AltConf	Trace
32	1	83	Total	C	N	O	S	0	0
			659	410	121	126	2		

- Molecule 33 is a protein called Rqc2 homolog RqcH.

Mol	Chain	Residues	Atoms					AltConf	Trace
33	0	532	Total	C	N	O	S	0	0
			3962	2504	705	743	10		

There are 29 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
0	97	ALA	ASP	conflict	UNP A0A6M4JI41
0	98	ALA	ARG	conflict	UNP A0A6M4JI41
0	571	GLY	-	expression tag	UNP A0A6M4JI41
0	572	SER	-	expression tag	UNP A0A6M4JI41
0	573	GLY	-	expression tag	UNP A0A6M4JI41
0	574	GLY	-	expression tag	UNP A0A6M4JI41

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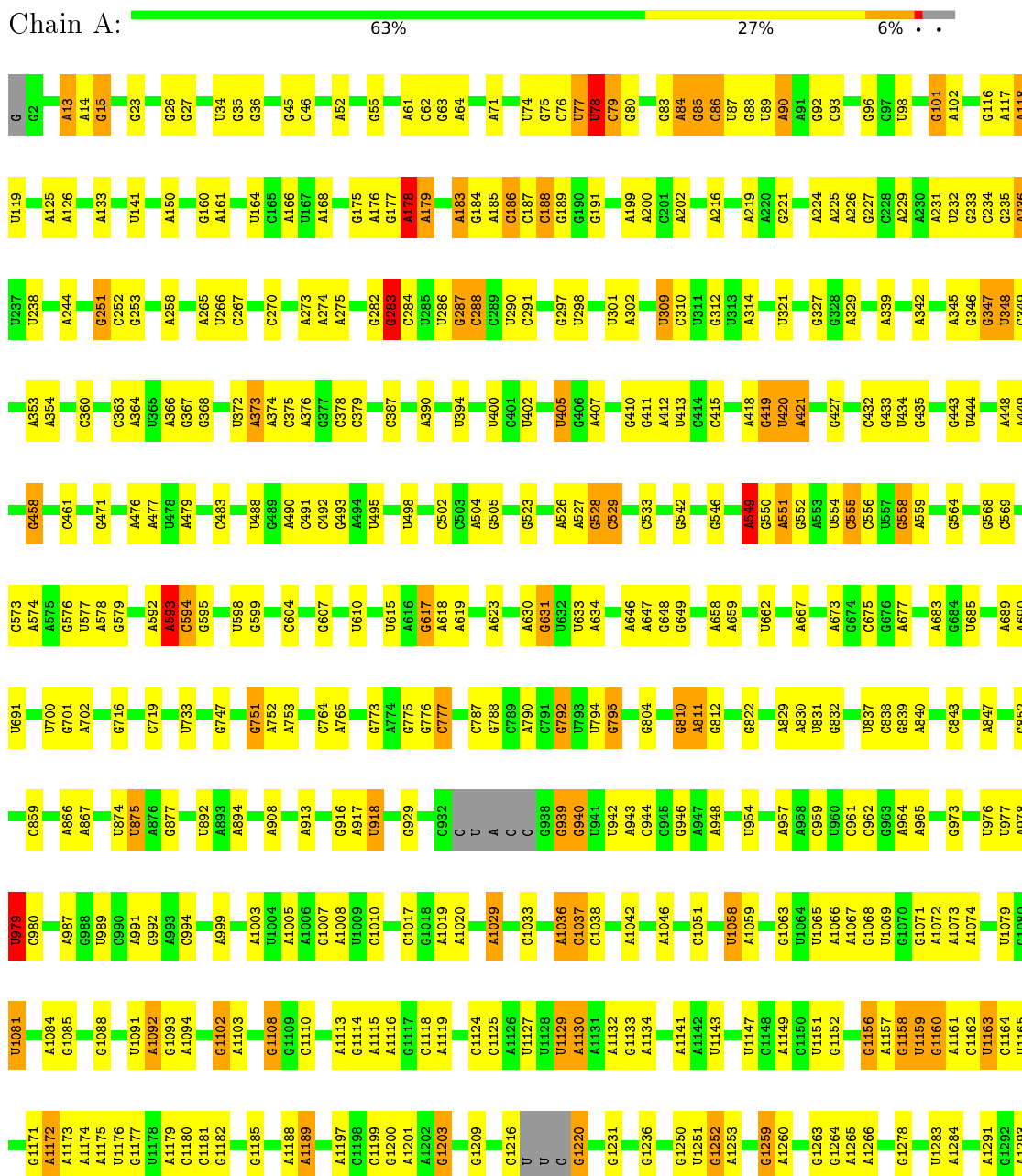
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Chain	Residue	Modelled	Actual	Comment	Reference
0	575	ASP	-	expression tag	UNP A0A6M4JI41
0	576	TYR	-	expression tag	UNP A0A6M4JI41
0	577	LYS	-	expression tag	UNP A0A6M4JI41
0	578	ASP	-	expression tag	UNP A0A6M4JI41
0	579	HIS	-	expression tag	UNP A0A6M4JI41
0	580	ASP	-	expression tag	UNP A0A6M4JI41
0	581	GLY	-	expression tag	UNP A0A6M4JI41
0	582	ASP	-	expression tag	UNP A0A6M4JI41
0	583	TYR	-	expression tag	UNP A0A6M4JI41
0	584	LYS	-	expression tag	UNP A0A6M4JI41
0	585	ASP	-	expression tag	UNP A0A6M4JI41
0	586	HIS	-	expression tag	UNP A0A6M4JI41
0	587	ASP	-	expression tag	UNP A0A6M4JI41
0	588	ILE	-	expression tag	UNP A0A6M4JI41
0	589	ASP	-	expression tag	UNP A0A6M4JI41
0	590	TYR	-	expression tag	UNP A0A6M4JI41
0	591	LYS	-	expression tag	UNP A0A6M4JI41
0	592	ASP	-	expression tag	UNP A0A6M4JI41
0	593	ASP	-	expression tag	UNP A0A6M4JI41
0	594	ASP	-	expression tag	UNP A0A6M4JI41
0	595	ASP	-	expression tag	UNP A0A6M4JI41
0	596	LYS	-	expression tag	UNP A0A6M4JI41
0	597	GLY	-	expression tag	UNP A0A6M4JI41

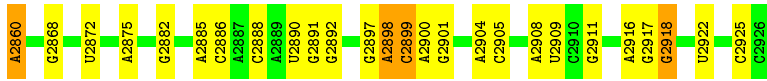
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

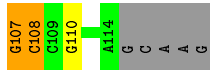
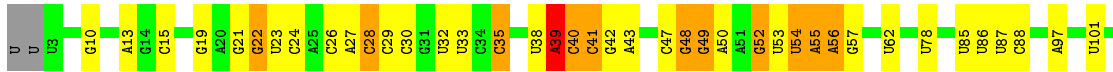
- Molecule 1: 23S rRNA



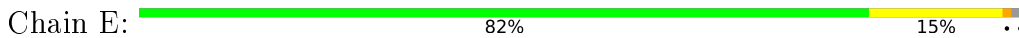
G2731	G2611	C2503	A2390	C2304	G	A2035	C1811	U1704	G1502	C1390	A1294
G2743	G2612	C2504	G2401	G2305	U	G2038	A1812	C1705	A1506	U1391	U1295
U2755	U2613	A2505	A2402	A2308	A	G2048	A1813	U1709	U1507	G1403	G1296
A2762	A2628	C2506	C2403	C2312	C	U2049	A1814	A1708	C1508	A1404	A1306
C2763	A2629	U2507	A2405	C2313	U	G2050	A1820	A1710	C1509	A1405	G1305
G2764	C2630	G2510	A2406	A2314	A	U2051	G1828	G1711	A1516	A1406	U1307
G2765	A2631	C2511	A2407	A2315	C	A2052	C1829	A1712	U1525	A1417	G1311
U2772	G2632	G2512	G2412	C2316	C	C2053	G1830	A1713	G1526	U1418	A1312
G2773	U2633	G2513	G2413	A2317	A	G2054	A1831	G1719	U1527	A1424	A1313
C2774	U2634	G2514	C2414	U2320	U	A2060	A1839	A1734	G1528	A1425	A1314
A2779	G2637	U2515	U2415	C2323	C	G2061	G1840	U1738	U1529	A1426	G1315
C2784	U2638	C2324	A2416	C2324	G	A2062	C1842	U1739	G1530	G1427	G1319
U2785	C2639	G2325	A2417	U2325	U	G2063	G1843	U1740	A1531	G1428	A1322
G2788	U2642	G2523	G2420	A2326	A	G2064	A1844	A1743	A1532	G1431	A1323
C2789	A2643	C2524	A2421	G2327	G	C2072	A1845	G1744	A1533	A1434	G1324
A2794	U2644	G2525	G2425	G2328	C	A2078	G1846	A1745	A1536	A1435	A1325
C2798	G2652	C2526	G2426	U2329	U	G2081	U1849	G1748	C1539	U1436	C1333
A2805	U2665	A2527	U2430	A2330	G	A2085	G1853	G1757	A1541	A1442	A1339
G2806	G2667	G2531	U2431	G2331	G	G2088	U1856	U1758	A1542	A1443	A1340
A2807	A2668	A2532	G2435	U2332	A	C2089	G1857	U1759	U1543	U1448	U1341
U2808	G2669	G2533	G2436	G2333	A	G2090	U1864	A1760	C1544	C1449	G1342
G2809	U2670	U2534	U2437	U2334	C	G2098	G1865	G1761	C1545	G1450	C1343
A2810	G2671	C2535	G2438	A2335	C	A2100	U1866	C1766	U1550	U1451	A1346
C2817	U2672	G2536	A2439	G2336	G	U2104	G1867	A1767	C1552	U1452	U1351
G2818	G2673	A2537	U2440	U2337	U	U2105	C1872	A1768	U1553	U1459	U1352
A2819	U2674	G2538	G2441	G2338	C	A2106	A1876	G1771	A1555	G1460	C1353
U2820	G2684	U2539	G2442	A2339	C	A2109	A1877	G1772	A1556	A1461	G1362
A2823	G2688	C2540	A2443	G2340	C	G2120	U1882	A1774	G1557	G1462	G1363
G2824	A2689	G2541	G2444	U2341	G	U2121	G1883	G1775	C1558	A1464	C1364
C2825	C2690	U2542	U2445	A2342	C	C2122	U1884	A1776	U1560	A1465	U1365
A2826	U2691	C2543	A2446	U2343	U	G2123	A1885	G1777	G1561	U1466	C1366
A2830	G2692	G2544	G2447	G2344	C	A2124	G1886	A1778	U1565	G1472	U1367
G2831	C2693	U2545	C2448	A2345	G	U2125	U1887	G1779	U1566	A1473	C1370
U2834	U2694	C2546	A2449	G2346	G	A2126	C1891	G1782	U1567	C1474	G1371
C2841	G2695	G2547	U2450	U2347	U	G2127	G1892	C1783	G1568	G1475	C1372
G2842	C2696	U2548	G2451	A2348	C	U2128	U1893	A1784	U1570	A1480	A1375
A2843	U2697	C2549	G2452	G2349	G	G2129	A1895	G1785	G1571	G1481	G1376
G2850	G2703	G2591	U2453	U2350	C	U2131	G1898	A1789	G1574	U1379	U1379
U2855	U2711	U2592	C2454	A2351	A	A	U1899	U1790	A1575	U1380	U1380
G2856	C2712	C2593	U2455	G2352	C	U2020	C1892	A1791	G1576	A1381	A1381
G2859	U2713	G2594	U2456	U2353	C	C	U1893	G1792	C1577	U1489	G1382
G2859	G2714	A2595	G2457	A2354	G	G	G1904	G1793	A	A1490	U1383
G2859	G2717	C2596	U2458	G2355	G	U2022	G1905	A1802	A	U1498	G1384
G2859	U2718	G2597	A2459	U2356	C	C	G1935	U1803	A	U1499	G1385
G2859	C2720	A2600	U2460	A2357	U	U	G1939	C1804	A	A1500	A1388
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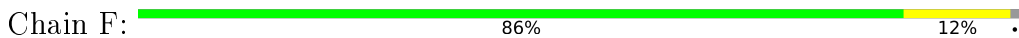
• Molecule 2: 5S rRNA



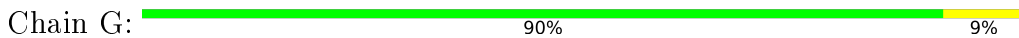
• Molecule 3: 50S ribosomal protein L2



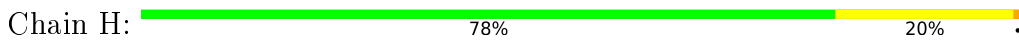
• Molecule 4: 50S ribosomal protein L3



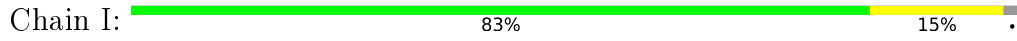
• Molecule 5: 50S ribosomal protein L4



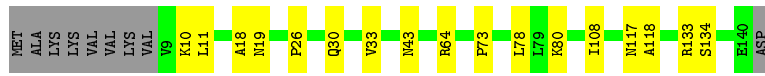
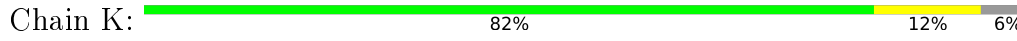
• Molecule 6: 50S ribosomal protein L5



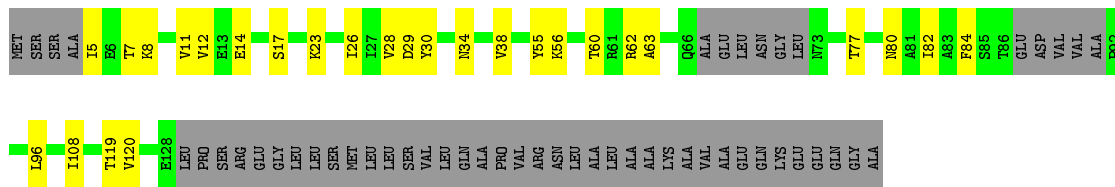
• Molecule 7: 50S ribosomal protein L6



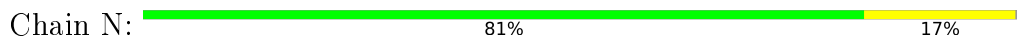
• Molecule 8: 50S ribosomal protein L11



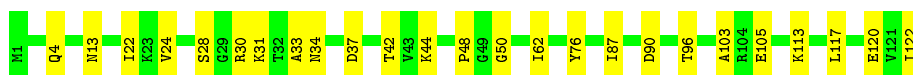
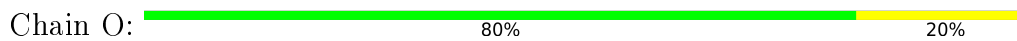
• Molecule 9: 50S ribosomal protein L10



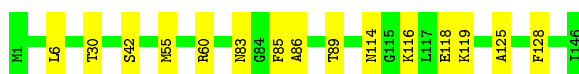
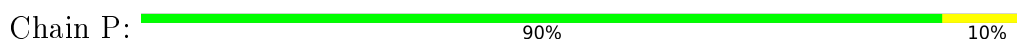
• Molecule 10: 50S ribosomal protein L13



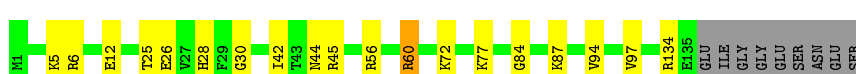
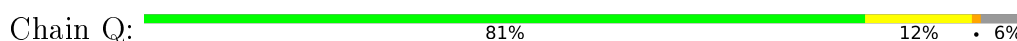
• Molecule 11: 50S ribosomal protein L14




• Molecule 12: 50S ribosomal protein L15



• Molecule 13: 50S ribosomal protein L16




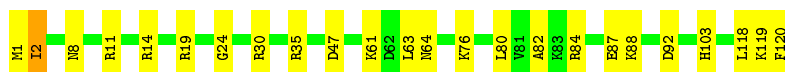
- Molecule 14: 50S ribosomal protein L17

Chain R:  80% 19%




- Molecule 15: 50S ribosomal protein L18

Chain S:  80% 19%




- Molecule 16: 50S ribosomal protein L19

Chain T:  87% 13%




- Molecule 17: 50S ribosomal protein L20

Chain U:  84% 13%




- Molecule 18: 50S ribosomal protein L21

Chain V:  88% 10%




- Molecule 19: 50S ribosomal protein L22

Chain W:  86% 11%




- Molecule 20: 50S ribosomal protein L23

Chain X:  85% 9% 5%



- Molecule 21: 50S ribosomal protein L24

Chain Y:  89% 9%




- Molecule 22: tRNA-Ala-UGC

Chain 2:  37% 37% 14% 8%



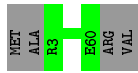
- Molecule 23: 50S ribosomal protein L27

Chain a:  85% 14%



- Molecule 24: 50S ribosomal protein L28

Chain b:  94% 6%



- Molecule 25: 50S ribosomal protein L29

Chain c:  98%




- Molecule 26: 50S ribosomal protein L30

Chain d:  98%



- Molecule 27: 50S ribosomal protein L32

Chain f:  86% 10%



- Molecule 28: 50S ribosomal protein L33 1





## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	16700	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 ( $e^-/\text{\AA}^2$ )	34.8	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor

## 5 Model quality

### 5.1 Standard geometry

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	A	1.20	8/67693 (0.0%)	1.15	164/105598 (0.2%)
2	B	1.03	1/2675 (0.0%)	1.31	36/4170 (0.9%)
3	E	0.70	0/2120	0.68	0/2845
4	F	0.71	0/1591	0.65	0/2132
5	G	0.68	0/1580	0.62	0/2132
6	H	0.77	0/1406	1.10	2/1888 (0.1%)
7	I	0.51	0/1360	0.63	0/1832
8	K	0.32	0/988	0.57	0/1336
9	L	0.34	0/892	0.58	0/1196
10	N	0.70	0/1147	0.62	0/1542
11	O	0.65	0/928	0.75	0/1245
12	P	0.64	0/1094	0.66	0/1457
13	Q	0.71	0/1099	0.70	0/1468
14	R	0.65	0/961	0.70	0/1284
15	S	0.56	0/922	0.71	0/1236
16	T	0.67	0/958	0.77	0/1279
17	U	0.74	0/952	0.70	0/1266
18	V	0.76	0/792	0.68	0/1063
19	W	0.64	0/851	0.72	0/1146
20	X	0.65	0/731	0.69	0/974
21	Y	0.62	0/772	0.67	1/1032 (0.1%)
22	2	0.97	1/1669 (0.1%)	1.63	37/2596 (1.4%)
23	a	0.76	0/632	0.72	0/839
24	b	0.46	0/448	0.70	0/596
25	c	0.54	0/531	0.71	0/707
26	d	0.63	0/458	0.69	0/613
27	f	0.68	0/425	0.71	1/563 (0.2%)
28	g	0.64	0/406	0.63	0/540
29	h	0.72	0/371	0.78	1/483 (0.2%)
30	i	0.66	0/519	0.68	0/680
31	j	0.75	0/300	0.63	0/393
32	1	0.68	1/662 (0.2%)	1.07	3/882 (0.3%)
33	0	0.39	4/4031 (0.1%)	0.75	18/5456 (0.3%)
All	All	1.05	15/101964 (0.0%)	1.07	263/152469 (0.2%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	15
2	B	0	4
3	E	0	1
6	H	0	1
8	K	0	1
13	Q	0	1
18	V	0	1
22	2	0	7
All	All	0	31

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	1220	G	P-OP2	7.36	1.61	1.49
1	A	1220	G	P-OP1	7.35	1.61	1.49
1	A	1939	G	O3'-P	-7.11	1.52	1.61
1	A	1940	U	C1'-N1	6.92	1.59	1.48
33	0	491	PRO	CG-CD	5.91	1.70	1.50

The worst 5 of 263 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
33	0	490	ILE	C-N-CD	-29.05	56.69	120.60
22	2	49	A	O5'-P-OP2	-27.30	77.94	110.70
22	2	49	A	O5'-P-OP1	-24.78	80.96	110.70
22	2	49	A	OP1-P-OP2	18.24	146.97	119.60
1	A	2334	U	O4'-C1'-N1	15.33	120.47	108.20

There are no chirality outliers.

5 of 31 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1866	C	Sidechain
1	A	1952	U	Sidechain
1	A	1953	C	Sidechain
1	A	1955	U	Sidechain
1	A	1957	A	Sidechain

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

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	60436	0	30414	330	0
2	B	2392	0	1213	7	0
3	E	2083	0	2168	29	0
4	F	1569	0	1637	19	0
5	G	1561	0	1647	13	0
6	H	1387	0	1448	74	0
7	I	1342	0	1388	19	0
8	K	974	0	1011	14	0
9	L	886	0	920	16	0
10	N	1124	0	1162	18	0
11	O	921	0	977	21	0
12	P	1082	0	1132	10	0
13	Q	1076	0	1145	13	0
14	R	954	0	983	19	0
15	S	913	0	947	26	0
16	T	945	0	1020	10	0
17	U	940	0	1005	14	0
18	V	781	0	821	9	0
19	W	842	0	899	6	0
20	X	725	0	770	7	0
21	Y	762	0	821	6	0
22	2	1496	0	759	43	0
23	a	624	0	639	0	0
24	b	444	0	487	0	0
25	c	530	0	568	0	0
26	d	456	0	491	0	0
27	f	418	0	435	0	0
28	g	401	0	413	0	0
29	h	368	0	410	0	0
30	i	512	0	564	0	0
31	j	297	0	342	0	0
32	1	659	0	705	1	0
33	0	3962	0	3687	94	0
All	All	93862	0	63028	641	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 5.

The worst 5 of 641 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:2340:A:C2	6:H:79:LEU:HD11	1.55	1.39
1:A:2334:U:O4	6:H:151:GLY:HA3	1.38	1.22
1:A:2334:U:C4	6:H:151:GLY:HA3	1.76	1.19
33:0:537:LYS:C	33:0:539:PRO:HD2	1.65	1.15
6:H:125:ARG:HG3	15:S:1:MET:HB2	1.27	1.14

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	E	270/277 (98%)	256 (95%)	12 (4%)	2 (1%)	22	61
4	F	204/209 (98%)	187 (92%)	17 (8%)	0	100	100
5	G	203/207 (98%)	184 (91%)	19 (9%)	0	100	100
6	H	174/179 (97%)	166 (95%)	8 (5%)	0	100	100
7	I	173/179 (97%)	153 (88%)	20 (12%)	0	100	100
8	K	130/141 (92%)	115 (88%)	15 (12%)	0	100	100
9	L	107/166 (64%)	106 (99%)	1 (1%)	0	100	100
10	N	140/145 (97%)	127 (91%)	13 (9%)	0	100	100
11	O	120/122 (98%)	105 (88%)	15 (12%)	0	100	100
12	P	144/146 (99%)	136 (94%)	8 (6%)	0	100	100
13	Q	133/144 (92%)	117 (88%)	16 (12%)	0	100	100
14	R	117/120 (98%)	106 (91%)	11 (9%)	0	100	100
15	S	118/120 (98%)	105 (89%)	12 (10%)	1 (1%)	19	58
16	T	113/115 (98%)	105 (93%)	8 (7%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
17	U	115/119 (97%)	106 (92%)	8 (7%)	1 (1%)	17	56
18	V	98/102 (96%)	80 (82%)	18 (18%)	0	100	100
19	W	107/113 (95%)	94 (88%)	13 (12%)	0	100	100
20	X	88/95 (93%)	83 (94%)	5 (6%)	0	100	100
21	Y	99/103 (96%)	84 (85%)	15 (15%)	0	100	100
23	a	79/94 (84%)	71 (90%)	8 (10%)	0	100	100
24	b	56/62 (90%)	50 (89%)	6 (11%)	0	100	100
25	c	63/66 (96%)	61 (97%)	2 (3%)	0	100	100
26	d	56/59 (95%)	54 (96%)	2 (4%)	0	100	100
27	f	51/59 (86%)	47 (92%)	4 (8%)	0	100	100
28	g	46/49 (94%)	41 (89%)	5 (11%)	0	100	100
29	h	42/44 (96%)	41 (98%)	1 (2%)	0	100	100
30	i	62/66 (94%)	59 (95%)	3 (5%)	0	100	100
31	j	35/37 (95%)	34 (97%)	1 (3%)	0	100	100
32	1	81/86 (94%)	79 (98%)	2 (2%)	0	100	100
33	0	518/599 (86%)	476 (92%)	39 (8%)	3 (1%)	25	64
All	All	3742/4023 (93%)	3428 (92%)	307 (8%)	7 (0%)	50	79

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	E	156	ARG
15	S	2	ILE
33	0	491	PRO
3	E	155	VAL
33	0	447	ASN

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

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	E	220/225 (98%)	220 (100%)	0	100	100
4	F	167/170 (98%)	167 (100%)	0	100	100
5	G	169/170 (99%)	168 (99%)	1 (1%)	86	94
6	H	151/154 (98%)	145 (96%)	6 (4%)	31	66
7	I	148/151 (98%)	148 (100%)	0	100	100
8	K	102/110 (93%)	102 (100%)	0	100	100
9	L	98/138 (71%)	97 (99%)	1 (1%)	76	90
10	N	120/123 (98%)	120 (100%)	0	100	100
11	O	101/101 (100%)	101 (100%)	0	100	100
12	P	110/110 (100%)	109 (99%)	1 (1%)	78	91
13	Q	109/116 (94%)	108 (99%)	1 (1%)	78	91
14	R	99/100 (99%)	98 (99%)	1 (1%)	76	90
15	S	93/93 (100%)	93 (100%)	0	100	100
16	T	100/100 (100%)	99 (99%)	1 (1%)	76	90
17	U	96/98 (98%)	95 (99%)	1 (1%)	76	90
18	V	83/84 (99%)	83 (100%)	0	100	100
19	W	90/93 (97%)	88 (98%)	2 (2%)	52	79
20	X	81/85 (95%)	81 (100%)	0	100	100
21	Y	85/87 (98%)	84 (99%)	1 (1%)	71	88
23	a	63/74 (85%)	62 (98%)	1 (2%)	62	84
24	b	47/50 (94%)	47 (100%)	0	100	100
25	c	56/57 (98%)	56 (100%)	0	100	100
26	d	52/53 (98%)	52 (100%)	0	100	100
27	f	47/53 (89%)	46 (98%)	1 (2%)	53	79
28	g	46/47 (98%)	46 (100%)	0	100	100
29	h	39/39 (100%)	38 (97%)	1 (3%)	46	76
30	i	54/56 (96%)	54 (100%)	0	100	100
31	j	35/35 (100%)	35 (100%)	0	100	100
32	l	73/75 (97%)	72 (99%)	1 (1%)	67	86
33	o	374/527 (71%)	372 (100%)	2 (0%)	88	95
All	All	3108/3374 (92%)	3086 (99%)	22 (1%)	84	94

5 of 22 residues with a non-rotameric sidechain are listed below:



Mol	Chain	Res	Type
19	W	37	ASN
27	f	7	ARG
23	a	22	ARG
29	h	28	ARG
6	H	165	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
32	1	61	ASN
33	0	326	GLN
33	0	385	ASN
33	0	335	ASN
30	i	60	GLN

### 5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	A	2808/2926 (95%)	667 (23%)	61 (2%)
2	B	111/119 (93%)	30 (27%)	3 (2%)
22	2	67/76 (88%)	15 (22%)	3 (4%)
All	All	2986/3121 (95%)	712 (23%)	67 (2%)

5 of 712 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	A	13	A
1	A	14	A
1	A	15	G
1	A	23	G
1	A	26	G

5 of 67 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	A	2510	G
1	A	2805	A
22	2	58	A
1	A	1339	A
1	A	1313	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.