



Full wwPDB EM Validation Report ⓘ

Feb 19, 2025 – 12:33 pm GMT

PDB ID : 8P8W
EMDB ID : EMD-17145
Title : Mycoplasma pneumoniae di-ribosome in chloramphenicol-treated cells (following 70S)
Authors : Schacherl, M.; Xue, L.; Spahn, C.M.T.; Mahamid, J.
Deposited on : 2023-06-02
Resolution : 8.70 Å (reported)
Based on initial models : 7OOC, 7OOD

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

EMDB validation analysis : **FAILED**
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.41

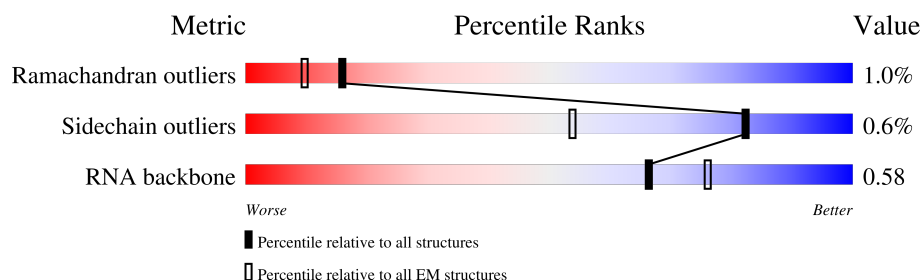
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 8.70 Å.

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




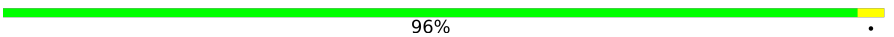



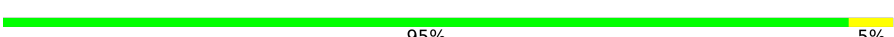
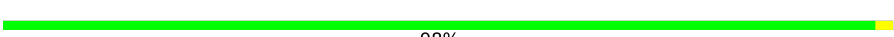



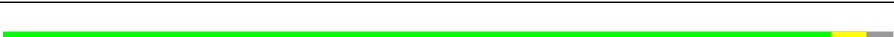


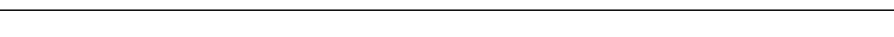
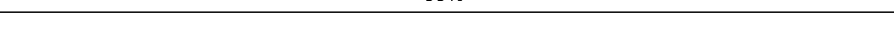
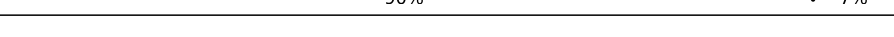
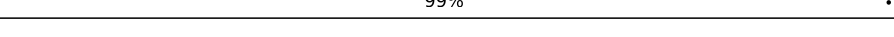

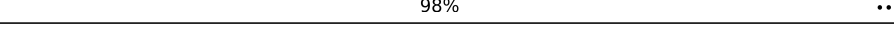
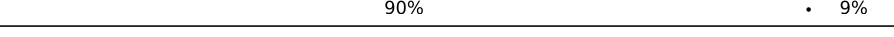
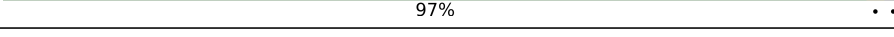
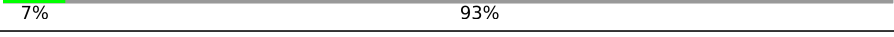
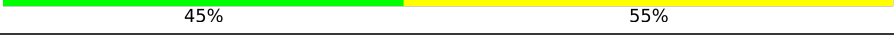
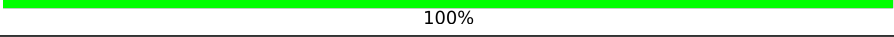
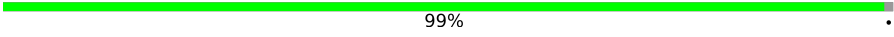
Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415
RNA backbone	6643	2191

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

Mol	Chain	Length	Quality of chain
1	0	48	
2	1	59	
3	2	37	
4	3	2907	
5	4	108	
6	5	1520	
7	6	76	
8	7	75	
9	A	294	
















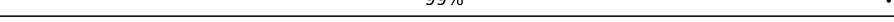


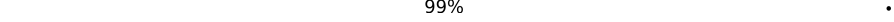

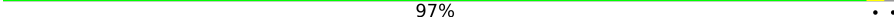
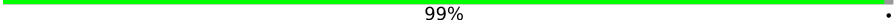

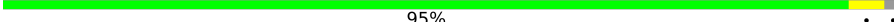
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Mol	Chain	Length	Quality of chain
10	B	273	
11	C	205	
11	U	205	
12	D	219	
13	E	215	
14	F	155	
15	G	142	
16	H	132	
17	I	108	
18	J	121	
19	K	139	
20	L	124	
21	M	61	
22	N	86	
23	O	94	
24	P	85	
25	Q	104	
26	R	87	
27	S	87	
28	T	60	
29	X	444	
30	Y	29	
31	Z	36	
32	a	287	
33	b	287	

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Mol	Chain	Length	Quality of chain
34	c	212	 100%
35	d	180	 99%
36	e	184	 95%
37	f	149	 99%
38	g	161	 76%
39	h	137	 93%
40	i	146	 98%
41	j	122	 98%
42	k	151	 99%
43	l	139	 97%
44	m	124	 95%
45	n	116	 100%
46	o	119	 99%
47	p	127	 93%
48	q	100	 99%
49	r	159	 87%
50	s	237	 40%
51	t	111	 99%
52	u	104	 93%
53	v	65	 97%
54	w	111	 99%
55	x	97	 90%
56	y	57	 95%
57	z	53	 94%

2 Entry composition

There are 61 unique types of molecules in this entry. The entry contains 151559 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
1	0	47	Total	C	N	O	S	0	0
			380	236	81	61	2		

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

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

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

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

- Molecule 4 is a RNA chain called 23S ribosomal RNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	3	2893	Total	C	N	O	P	0	0
			61995	27704	11293	20105	2893		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
5	4	108	Total	C	N	O	P	0	0
			2305	1030	415	752	108		

- Molecule 6 is a RNA chain called 16S ribosomal RNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	5	1507	Total	C	N	O	P	0	0
			32258	14420	5847	10484	1507		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
5	1003	A	G	conflict	GB 26117688

- Molecule 7 is a RNA chain called tRNA-Ala (E-site).

Mol	Chain	Residues	Atoms					AltConf	Trace
7	6	76	Total	C	N	O	P	0	0
			1620	723	287	534	76		

- Molecule 8 is a RNA chain called tRNA-Asp (P-site).

Mol	Chain	Residues	Atoms					AltConf	Trace
8	7	75	Total	C	N	O	P	0	0
			1599	712	279	533	75		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
7	17	G	-	insertion	GB 26117688
7	55	C	U	conflict	GB 26117688

- Molecule 9 is a protein called 30S ribosomal protein S2.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	A	268	Total	C	N	O	S	0	0
			2152	1368	379	396	9		

- Molecule 10 is a protein called 30S ribosomal protein S3.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	B	225	Total	C	N	O	S	0	0
			1773	1121	328	319	5		

- Molecule 11 is a protein called 30S ribosomal protein S4.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	C	204	Total	C	N	O	S	0	0
			1669	1057	316	292	4		
11	U	204	Total	C	N	O	S	0	0
			1669	1057	316	292	4		

- Molecule 12 is a protein called 30S ribosomal protein S5.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	D	173	Total	C	N	O	S	0	0
			1346	846	265	232	3		

- Molecule 13 is a protein called 30S ribosomal protein S6.

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

- Molecule 14 is a protein called 30S ribosomal protein S7.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	F	155	Total	C	N	O	S	0	0
			1254	790	240	217	7		

- Molecule 15 is a protein called 30S ribosomal protein S8.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	G	142	Total	C	N	O	S	0	0
			1118	728	194	193	3		

- Molecule 16 is a protein called 30S ribosomal protein S9.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	H	129	Total	C	N	O	S	0	0
			1040	661	195	183	1		

- Molecule 17 is a protein called 30S ribosomal protein S10.

Mol	Chain	Residues	Atoms					AltConf	Trace
17	I	104	Total	C	N	O	S	0	0
			832	536	147	148	1		

- Molecule 18 is a protein called 30S ribosomal protein S11.

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

- Molecule 19 is a protein called 30S ribosomal protein S12.

Mol	Chain	Residues	Atoms					AltConf	Trace
19	K	135	Total	C	N	O	S	0	0
			1071	677	212	180	2		

- Molecule 20 is a protein called 30S ribosomal protein S13.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	L	121	Total	C	N	O	S	0	0
			975	609	197	169			

- Molecule 21 is a protein called 30S ribosomal protein S14 type Z.

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

- Molecule 22 is a protein called 30S ribosomal protein S15.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	N	86	Total	C	N	O	S	0	0
			697	441	131	124	1		

- Molecule 23 is a protein called 30S ribosomal protein S16.

Mol	Chain	Residues	Atoms					AltConf	Trace
23	O	87	Total	C	N	O	S	0	0
			705	453	130	118	4		

- Molecule 24 is a protein called 30S ribosomal protein S17.

Mol	Chain	Residues	Atoms					AltConf	Trace
24	P	85	Total	C	N	O	S	0	0
			693	436	138	118	1		

- Molecule 25 is a protein called 30S ribosomal protein S18.

Mol	Chain	Residues	Atoms					AltConf	Trace
25	Q	78	Total	C	N	O	S	0	0
			651	417	129	100	5		

- Molecule 26 is a protein called 30S ribosomal protein S19.

Mol	Chain	Residues	Atoms					AltConf	Trace
26	R	86	Total	C	N	O	S	0	0
			700	444	132	122	2		

- Molecule 27 is a protein called 30S ribosomal protein S20.

Mol	Chain	Residues	Atoms					AltConf	Trace
27	S	79	Total	C	N	O		0	0
			643	391	138	114			

- Molecule 28 is a protein called 30S ribosomal protein S21.

Mol	Chain	Residues	Atoms					AltConf	Trace
28	T	59	Total	C	N	O	S	0	0
			519	326	111	80	2		

- Molecule 29 is a protein called Trigger factor.

Mol	Chain	Residues	Atoms					AltConf	Trace
29	X	30	Total	C	N	O	S	0	0
			242	155	43	43	1		

- Molecule 30 is a RNA chain called mRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
30	Y	29	Total	C	N	O	P	0	0
			623	280	120	194	29		

- Molecule 31 is a protein called Nascent chain.

Mol	Chain	Residues	Atoms				AltConf	Trace
31	Z	36	Total	C	N	O	0	0
			187	112	37	38		

- Molecule 32 is a protein called 50S ribosomal protein L2.

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

- Molecule 33 is a protein called 50S ribosomal protein L3.

Mol	Chain	Residues	Atoms					AltConf	Trace
33	b	231	Total	C	N	O	S	0	0
			1778	1129	320	322	7		

- Molecule 34 is a protein called 50S ribosomal protein L4.

Mol	Chain	Residues	Atoms					AltConf	Trace
34	c	211	Total	C	N	O	S	0	0
			1654	1053	299	299	3		

- Molecule 35 is a protein called 50S ribosomal protein L5.

Mol	Chain	Residues	Atoms					AltConf	Trace
35	d	179	Total	C	N	O	S	0	0
			1416	910	251	251	4		

- Molecule 36 is a protein called 50S ribosomal protein L6.

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

- Molecule 37 is a protein called 50S ribosomal protein L9.

Mol	Chain	Residues	Atoms					AltConf	Trace
37	f	149	Total	C	N	O	S	0	0
			1210	780	212	215	3		

- Molecule 38 is a protein called 50S ribosomal protein L10.

Mol	Chain	Residues	Atoms					AltConf	Trace
38	g	125	Total	C	N	O	S	0	0
			951	606	165	177	3		

- Molecule 39 is a protein called 50S ribosomal protein L11.

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

- Molecule 40 is a protein called 50S ribosomal protein L13.

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

- Molecule 41 is a protein called 50S ribosomal protein L14.

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

- Molecule 42 is a protein called 50S ribosomal protein L15.

Mol	Chain	Residues	Atoms					AltConf	Trace
42	k	150	Total	C	N	O	S	0	0
			1170	741	228	200	1		

- Molecule 43 is a protein called 50S ribosomal protein L16.

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

- Molecule 44 is a protein called 50S ribosomal protein L17.

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

- Molecule 45 is a protein called 50S ribosomal protein L18.

Mol	Chain	Residues	Atoms					AltConf	Trace
45	n	116	Total	C	N	O	S	0	0
			918	573	181	162	2		

- Molecule 46 is a protein called 50S ribosomal protein L19.

Mol	Chain	Residues	Atoms					AltConf	Trace
46	o	118	Total	C	N	O	S	0	0
			966	609	186	170	1		

- Molecule 47 is a protein called 50S ribosomal protein L20.

Mol	Chain	Residues	Atoms					AltConf	Trace
47	p	118	Total	C	N	O	S	0	0
			981	624	194	161	2		

- Molecule 48 is a protein called 50S ribosomal protein L21.

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

- Molecule 49 is a protein called 50S ribosomal protein L22.

Mol	Chain	Residues	Atoms					AltConf	Trace
49	r	142	Total	C	N	O	S	0	0
			1091	677	212	195	7		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
50	s	95	Total	C	N	O	S	0	0
			740	486	125	128	1		

- Molecule 51 is a protein called 50S ribosomal protein L24.

Mol	Chain	Residues	Atoms					AltConf	Trace
51	t	111	Total	C	N	O	S	0	0
			871	550	166	152	3		

- Molecule 52 is a protein called 50S ribosomal protein L27.

Mol	Chain	Residues	Atoms					AltConf	Trace
52	u	101	Total	C	N	O	S	0	0
			786	498	148	139	1		

- Molecule 53 is a protein called 50S ribosomal protein L28.

Mol	Chain	Residues	Atoms					AltConf	Trace
53	v	64	Total	C	N	O	S	0	0
			520	320	109	90	1		

- Molecule 54 is a protein called 50S ribosomal protein L29.

Mol	Chain	Residues	Atoms				AltConf	Trace
54	w	110	Total	C	N	O	0	0
			906	576	168	162		

- Molecule 55 is a protein called 50S ribosomal protein L31.

Mol	Chain	Residues	Atoms					AltConf	Trace
55	x	89	Total	C	N	O	S	0	0
			708	449	124	131	4		

- Molecule 56 is a protein called 50S ribosomal protein L32.

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

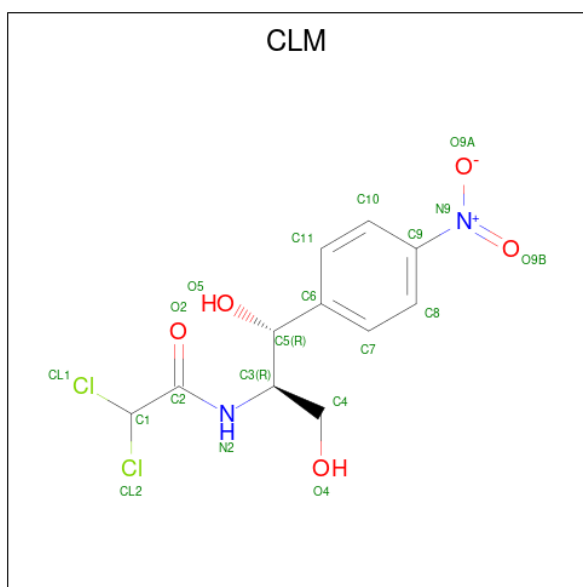
- Molecule 57 is a protein called 50S ribosomal protein L33 1.

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

- Molecule 58 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
58	2	1	Total	Zn	0
			1	1	
58	M	1	Total	Zn	0
			1	1	
58	Q	1	Total	Zn	0
			1	1	
58	x	1	Total	Zn	0
			1	1	
58	y	1	Total	Zn	0
			1	1	
58	z	1	Total	Zn	0
			1	1	

- Molecule 59 is CHLORAMPHENICOL (three-letter code: CLM) (formula: C₁₁H₁₂Cl₂N₂O₅) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
59	3	1	Total	C	Cl	N	O	0
			20	11	2	2	5	

- Molecule 60 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms		AltConf
60	3	1	Total	K	0
			1	1	

- Molecule 61 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
61	3	206	Total	Mg	0
			206	206	
61	4	1	Total	Mg	0
			1	1	
61	5	90	Total	Mg	0
			90	90	
61	6	1	Total	Mg	0
			1	1	
61	K	1	Total	Mg	0
			1	1	
61	P	1	Total	Mg	0
			1	1	
61	Y	1	Total	Mg	0
			1	1	

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Mol	Chain	Residues	Atoms		AltConf
61	b	2	Total 2	Mg 2	0
61	i	1	Total 1	Mg 1	0
61	k	2	Total 2	Mg 2	0
61	y	2	Total 2	Mg 2	0

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. 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: 50S ribosomal protein L34

Chain 0:  98% .



- Molecule 2: 50S ribosomal protein L35

Chain 1:  100%


There are no outlier residues recorded for this chain.

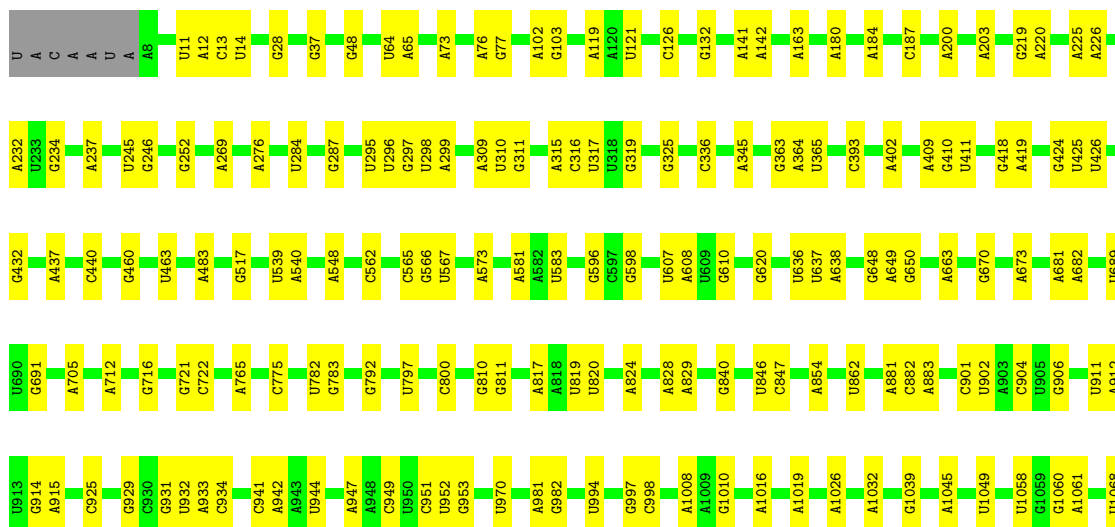
- Molecule 3: 50S ribosomal protein L36

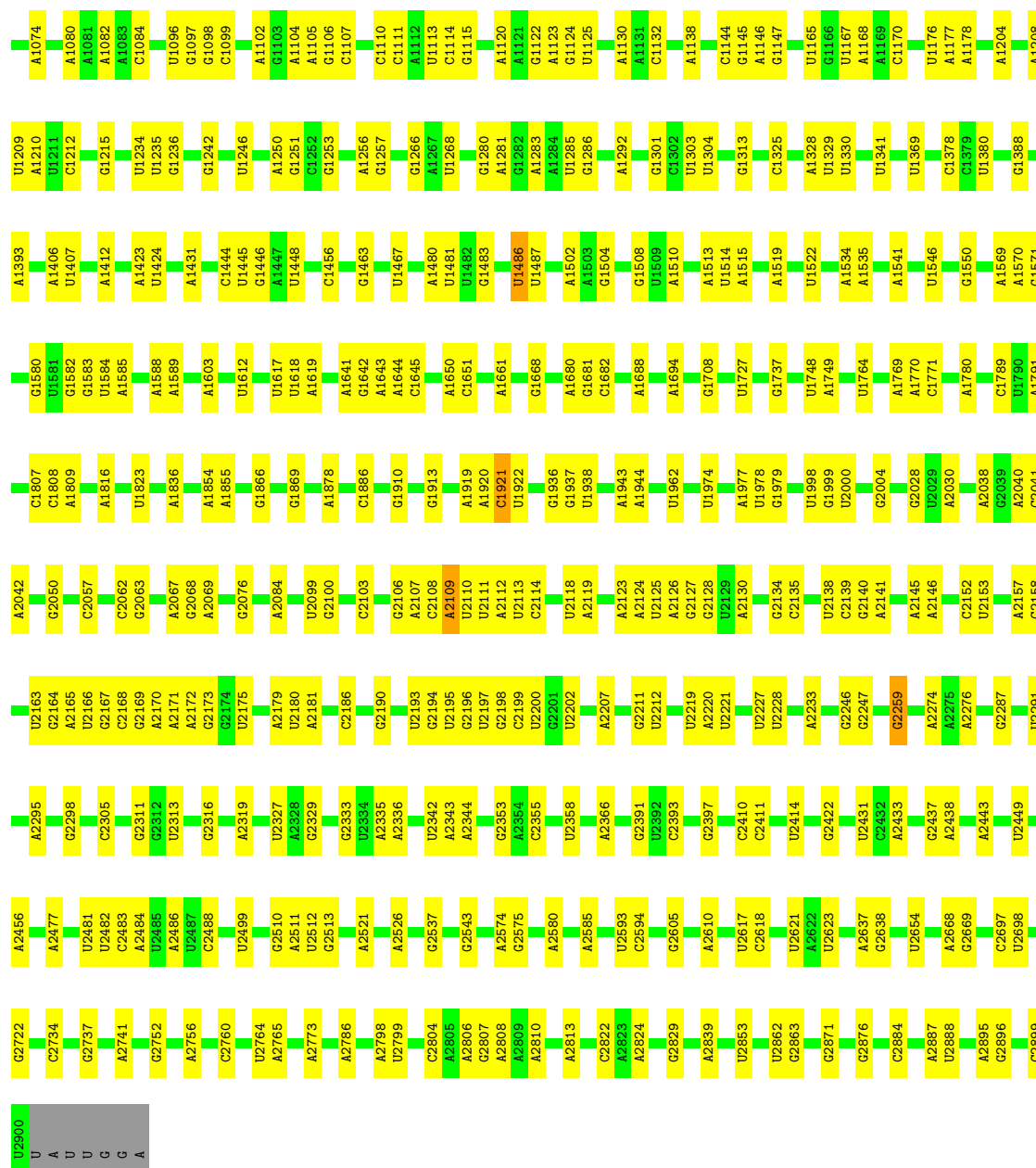
Chain 2:  100%

There are no outlier residues recorded for this chain.

- Molecule 4: 23S ribosomal RNA

Chain 3:  81% 19%





• Molecule 5: 5S ribosomal RNA

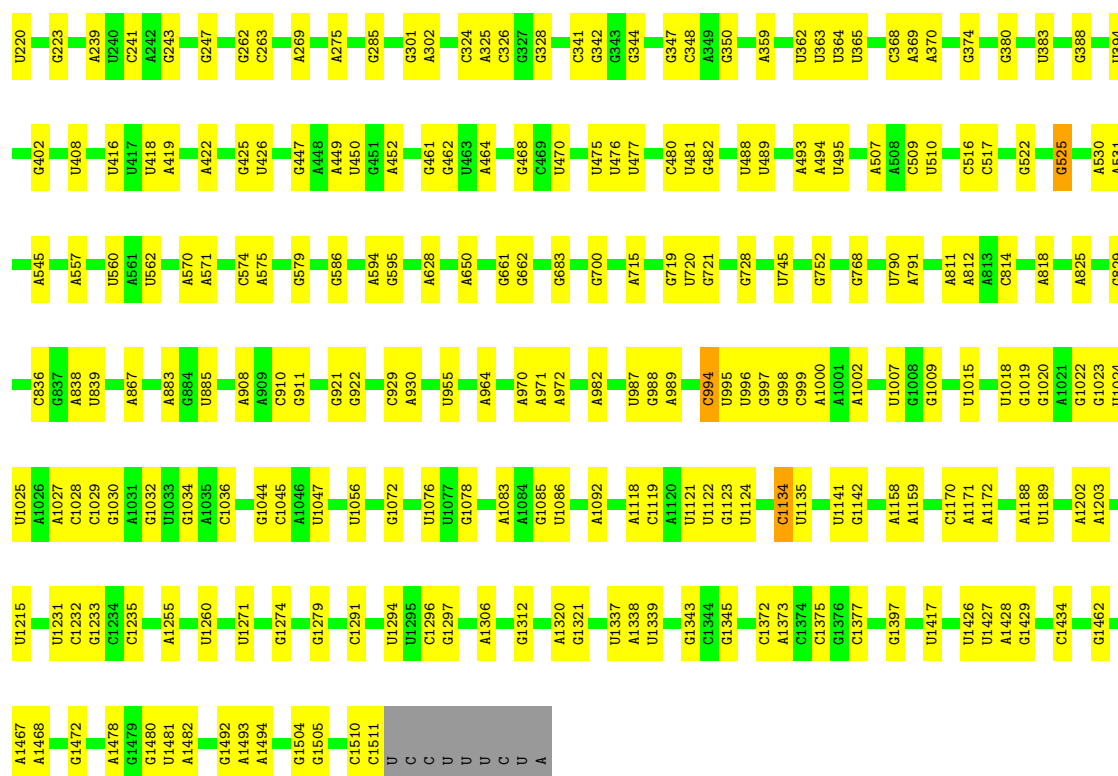
Chain 4: 73% 27%



• Molecule 6: 16S ribosomal RNA

Chain 5: 82% 17%

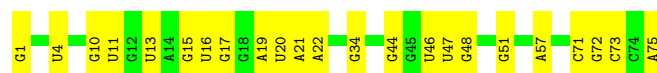




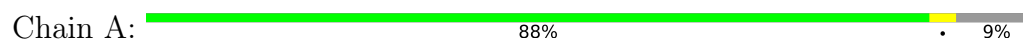
• Molecule 7: tRNA-Ala (E-site)



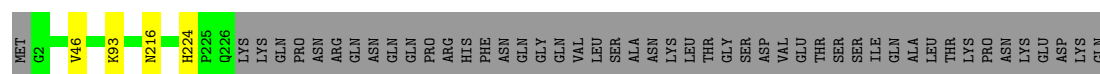
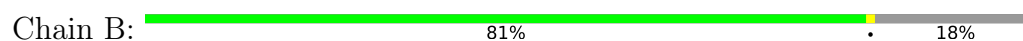
• Molecule 8: tRNA-Asp (P-site)



• Molecule 9: 30S ribosomal protein S2



• Molecule 10: 30S ribosomal protein S3



- Molecule 11: 30S ribosomal protein S4

Chain C:  96%




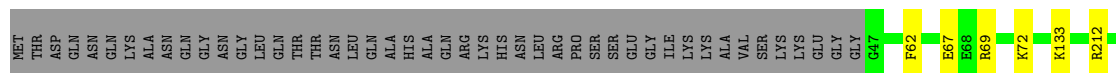
- Molecule 11: 30S ribosomal protein S4

Chain U:  91%




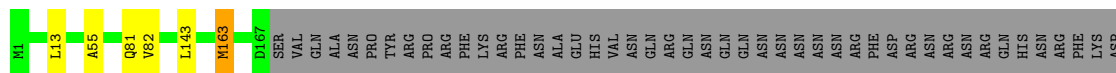
- Molecule 12: 30S ribosomal protein S5

Chain D:  76%



- Molecule 13: 30S ribosomal protein S6

Chain E:  75%



- Molecule 14: 30S ribosomal protein S7

Chain F:  95%



- Molecule 15: 30S ribosomal protein S8

Chain G:  98%



- Molecule 16: 30S ribosomal protein S9

Chain H:  97% ..



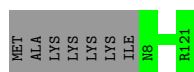
- Molecule 17: 30S ribosomal protein S10

Chain I:  94% ..



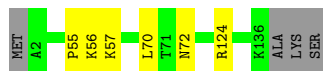
- Molecule 18: 30S ribosomal protein S11

Chain J:  94% 6%



- Molecule 19: 30S ribosomal protein S12

Chain K:  93% ..



- Molecule 20: 30S ribosomal protein S13

Chain L:  97% ..



- Molecule 21: 30S ribosomal protein S14 type Z

Chain M:  98% .



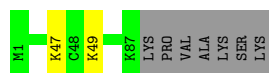
- Molecule 22: 30S ribosomal protein S15

Chain N:  99% .



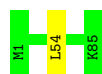
- Molecule 23: 30S ribosomal protein S16

Chain O:  90% 7%



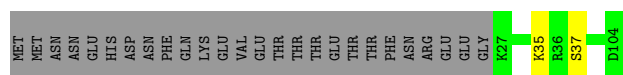
- Molecule 24: 30S ribosomal protein S17

Chain P:  99%



- Molecule 25: 30S ribosomal protein S18

Chain Q:  73% 25%




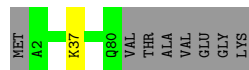
- Molecule 26: 30S ribosomal protein S19

Chain R:  98%



- Molecule 27: 30S ribosomal protein S20

Chain S:  90% 9%



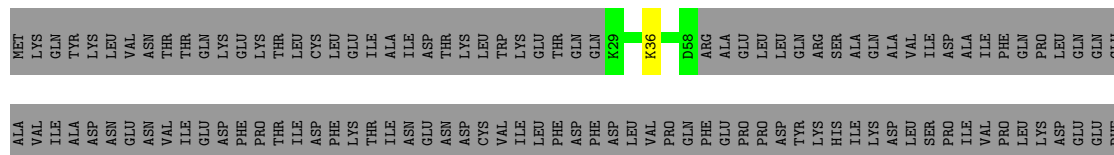
- Molecule 28: 30S ribosomal protein S21

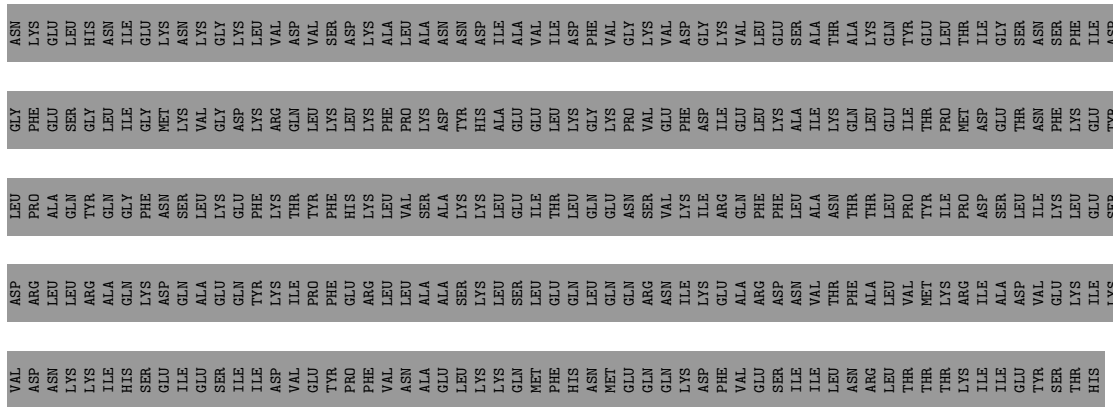
Chain T:  97%



- Molecule 29: Trigger factor

Chain X:  7% 93%





- Molecule 30: mRNA

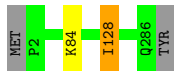


- Molecule 31: Nascent chain

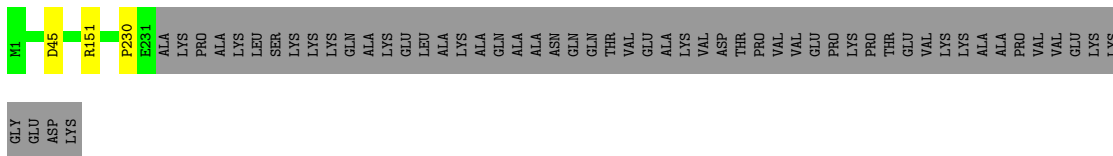
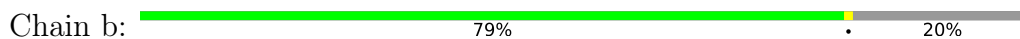


There are no outlier residues recorded for this chain.

- Molecule 32: 50S ribosomal protein L2



- Molecule 33: 50S ribosomal protein L3



- Molecule 34: 50S ribosomal protein L4



- Molecule 35: 50S ribosomal protein L5

Chain d:  99% ..



- Molecule 36: 50S ribosomal protein L6

Chain e:  95% ..




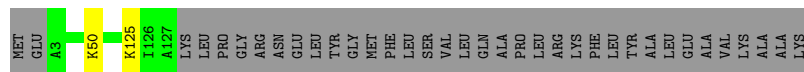
- Molecule 37: 50S ribosomal protein L9

Chain f:  99% .



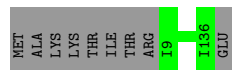
- Molecule 38: 50S ribosomal protein L10

Chain g:  76% . 22%



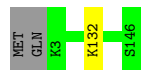
- Molecule 39: 50S ribosomal protein L11

Chain h:  93% 7%



- Molecule 40: 50S ribosomal protein L13

Chain i:  98% ..



- Molecule 41: 50S ribosomal protein L14

Chain j:  98% .



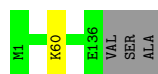
- Molecule 42: 50S ribosomal protein L15

Chain k:  99% ..



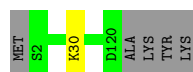
- Molecule 43: 50S ribosomal protein L16

Chain l:  97% ..



- Molecule 44: 50S ribosomal protein L17

Chain m:  95% . .



- Molecule 45: 50S ribosomal protein L18

Chain n:  100%

There are no outlier residues recorded for this chain.

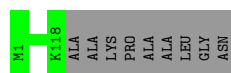
- Molecule 46: 50S ribosomal protein L19

Chain o:  99% .



- Molecule 47: 50S ribosomal protein L20

Chain p:  93% 7%



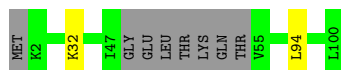
- Molecule 48: 50S ribosomal protein L21

Chain q:  99% .



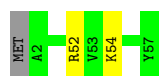
- Molecule 49: 50S ribosomal protein L22

Chain r:  87% 11%



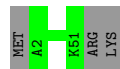
- Molecule 56: 50S ribosomal protein L32

Chain y:  95% . .



- Molecule 57: 50S ribosomal protein L33 1

Chain z:  94% 6%



4 Experimental information

Property	Value	Source
EM reconstruction method	SUBTOMOGRAM AVERAGING	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of subtomograms used	963	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION; CTF estimation and 3D CTF correction are done in Warp	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	137	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	3250	Depositor
Magnification	64000	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 5MC, B8T, CLM, 1MG, OMG, 7MG, ZN, 2MA, K, MG, MA6

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	0.25	0/383	0.61	0/504
2	1	0.25	0/484	0.53	0/637
3	2	0.27	0/306	0.68	0/401
4	3	0.18	0/69363	0.73	9/108161 (0.0%)
5	4	0.15	0/2578	0.72	0/4016
6	5	0.18	0/35992	0.72	5/56111 (0.0%)
7	6	0.34	1/1810 (0.1%)	0.86	3/2817 (0.1%)
8	7	0.40	2/1785 (0.1%)	0.77	0/2779
9	A	0.31	0/2186	0.67	4/2952 (0.1%)
10	B	0.28	0/1800	0.62	1/2433 (0.0%)
11	C	0.34	0/1700	0.72	0/2278
11	U	0.34	0/1700	0.78	0/2278
12	D	0.30	0/1365	0.66	0/1827
13	E	0.28	0/1384	0.71	2/1867 (0.1%)
14	F	0.29	0/1274	0.66	0/1710
15	G	0.31	0/1134	0.69	1/1527 (0.1%)
16	H	0.28	0/1056	0.65	0/1409
17	I	0.30	0/843	0.69	2/1132 (0.2%)
18	J	0.27	0/844	0.57	0/1136
19	K	0.26	0/1089	0.63	0/1461
20	L	0.28	0/986	0.67	0/1321
21	M	0.35	0/483	0.69	0/643
22	N	0.24	0/703	0.61	0/936
23	O	0.32	0/718	0.76	0/962
24	P	0.25	0/702	0.62	0/934
25	Q	0.27	0/663	0.69	0/883
26	R	0.30	0/716	0.61	1/958 (0.1%)
27	S	0.26	0/645	0.55	0/857
28	T	0.30	0/524	0.79	1/685 (0.1%)
29	X	0.28	0/245	0.72	0/325
30	Y	0.29	0/699	0.90	0/1087
31	Z	0.74	0/26	1.33	0/33

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
32	a	0.26	0/2267	0.61	1/3044 (0.0%)
33	b	0.29	0/1812	0.63	1/2436 (0.0%)
34	c	0.27	0/1681	0.57	0/2257
35	d	0.27	0/1437	0.61	0/1931
36	e	0.30	0/1420	0.60	0/1912
37	f	0.27	0/1233	0.59	0/1653
38	g	0.28	0/960	0.56	0/1284
39	h	0.25	0/968	0.54	0/1298
40	i	0.26	0/1186	0.58	0/1592
41	j	0.29	0/953	0.68	0/1275
42	k	0.26	0/1187	0.62	1/1581 (0.1%)
43	l	0.30	0/1104	0.61	0/1481
44	m	0.27	0/973	0.58	0/1309
45	n	0.25	0/927	0.61	0/1239
46	o	0.29	0/976	0.65	0/1296
47	p	0.25	0/996	0.55	0/1325
48	q	0.30	0/828	0.64	0/1111
49	r	0.27	0/1100	0.67	3/1471 (0.2%)
50	s	0.26	0/752	0.53	0/1015
51	t	0.30	0/878	0.69	1/1165 (0.1%)
52	u	0.25	0/798	0.58	0/1063
53	v	0.30	0/526	0.82	1/703 (0.1%)
54	w	0.23	0/916	0.50	0/1222
55	x	0.30	0/722	0.71	2/959 (0.2%)
56	y	0.27	0/457	0.74	1/601 (0.2%)
57	z	0.26	0/412	0.59	0/547
All	All	0.22	3/163655 (0.0%)	0.71	40/243830 (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
11	U	0	2

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	6	1	G	OP3-P	-10.58	1.48	1.61
8	7	1	G	OP3-P	-10.54	1.48	1.61
8	7	72	G	O3'-P	-8.01	1.51	1.61

All (40) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	3	2109	A	O5'-P-OP2	-10.18	96.54	105.70
6	5	1434	C	P-O3'-C3'	-9.93	107.79	119.70
53	v	58	LEU	CA-CB-CG	8.88	135.72	115.30
55	x	94	LEU	CA-CB-CG	7.74	133.10	115.30
4	3	393	C	C6-N1-C2	-7.29	117.38	120.30
4	3	1486	U	C2-N1-C1'	7.18	126.32	117.70
49	r	69	LEU	CA-CB-CG	6.66	130.62	115.30
4	3	1486	U	N1-C2-O2	6.58	127.41	122.80
42	k	90	LEU	CA-CB-CG	6.56	130.40	115.30
7	6	46	G	P-O3'-C3'	6.23	127.17	119.70
49	r	137	MET	CA-CB-CG	6.18	123.81	113.30
13	E	13	LEU	CA-CB-CG	6.07	129.26	115.30
51	t	95	PRO	CA-N-CD	-6.03	103.05	111.50
4	3	1486	U	N3-C2-O2	-6.03	117.98	122.20
9	A	32	MET	CB-CG-SD	-5.88	94.78	112.40
26	R	76	PRO	CA-N-CD	-5.86	103.30	111.50
4	3	1341	U	C2-N1-C1'	5.67	124.51	117.70
9	A	17	LEU	CA-CB-CG	5.65	128.30	115.30
32	a	128	ILE	CG1-CB-CG2	-5.62	99.03	111.40
7	6	33	U	P-O3'-C3'	5.54	126.34	119.70
4	3	1303	U	C2-N1-C1'	5.50	124.30	117.70
55	x	94	LEU	C-N-CA	5.47	135.37	121.70
7	6	75	C	O5'-P-OP1	-5.45	100.80	105.70
13	E	163	MET	CA-CB-CG	5.40	122.49	113.30
28	T	36	LEU	CA-CB-CG	5.40	127.72	115.30
4	3	1921	C	P-O3'-C3'	5.39	126.17	119.70
9	A	26	MET	CA-CB-CG	5.37	122.42	113.30
17	I	106	PHE	CB-CG-CD2	-5.34	117.06	120.80
10	B	224	HIS	C-N-CD	-5.29	108.96	120.60
56	y	52	ARG	CA-CB-CG	5.29	125.05	113.40
6	5	994	C	N1-C2-O2	5.29	122.07	118.90
33	b	45	ASP	CB-CG-OD1	5.25	123.03	118.30
9	A	245	MET	CG-SD-CE	-5.19	91.89	100.20
15	G	52	GLY	N-CA-C	5.18	126.04	113.10
4	3	393	C	P-O3'-C3'	5.17	125.91	119.70
6	5	1375	5MC	P-O3'-C3'	-5.16	113.50	119.70
17	I	106	PHE	CB-CG-CD1	5.08	124.36	120.80
49	r	1	MET	CA-CB-CG	5.07	121.92	113.30
6	5	1134	C	C2-N1-C1'	5.05	124.35	118.80
6	5	1119	C	N1-C2-O2	5.01	121.91	118.90

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
11	U	121	HIS	Peptide
11	U	153	ILE	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 [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	
1	0	45/48 (94%)	45 (100%)	0	0	100	100
2	1	57/59 (97%)	57 (100%)	0	0	100	100
3	2	35/37 (95%)	35 (100%)	0	0	100	100
9	A	264/294 (90%)	233 (88%)	25 (10%)	6 (2%)	5	28
10	B	223/273 (82%)	197 (88%)	24 (11%)	2 (1%)	14	52
11	C	202/205 (98%)	166 (82%)	33 (16%)	3 (2%)	8	40
11	U	202/205 (98%)	148 (73%)	41 (20%)	13 (6%)	1	13
12	D	171/219 (78%)	141 (82%)	25 (15%)	5 (3%)	3	23
13	E	165/215 (77%)	142 (86%)	18 (11%)	5 (3%)	3	23
14	F	153/155 (99%)	132 (86%)	15 (10%)	6 (4%)	2	19
15	G	140/142 (99%)	132 (94%)	8 (6%)	0	100	100
16	H	127/132 (96%)	115 (91%)	12 (9%)	0	100	100
17	I	102/108 (94%)	88 (86%)	13 (13%)	1 (1%)	13	49
18	J	112/121 (93%)	105 (94%)	7 (6%)	0	100	100
19	K	133/139 (96%)	113 (85%)	15 (11%)	5 (4%)	2	19
20	L	119/124 (96%)	112 (94%)	7 (6%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
21	M	58/61 (95%)	56 (97%)	2 (3%)	0	100	100
22	N	84/86 (98%)	77 (92%)	6 (7%)	1 (1%)	11	44
23	O	85/94 (90%)	78 (92%)	5 (6%)	2 (2%)	5	27
24	P	83/85 (98%)	71 (86%)	11 (13%)	1 (1%)	11	44
25	Q	76/104 (73%)	65 (86%)	9 (12%)	2 (3%)	4	26
26	R	84/87 (97%)	79 (94%)	5 (6%)	0	100	100
27	S	77/87 (88%)	74 (96%)	2 (3%)	1 (1%)	10	43
28	T	57/60 (95%)	55 (96%)	2 (4%)	0	100	100
29	X	28/444 (6%)	24 (86%)	4 (14%)	0	100	100
31	Z	3/36 (8%)	3 (100%)	0	0	100	100
32	a	283/287 (99%)	267 (94%)	15 (5%)	1 (0%)	30	68
33	b	229/287 (80%)	219 (96%)	9 (4%)	1 (0%)	30	68
34	c	209/212 (99%)	198 (95%)	11 (5%)	0	100	100
35	d	177/180 (98%)	169 (96%)	8 (4%)	0	100	100
36	e	174/184 (95%)	162 (93%)	12 (7%)	0	100	100
37	f	147/149 (99%)	131 (89%)	15 (10%)	1 (1%)	19	57
38	g	123/161 (76%)	117 (95%)	6 (5%)	0	100	100
39	h	126/137 (92%)	121 (96%)	5 (4%)	0	100	100
40	i	142/146 (97%)	133 (94%)	9 (6%)	0	100	100
41	j	120/122 (98%)	115 (96%)	5 (4%)	0	100	100
42	k	148/151 (98%)	138 (93%)	10 (7%)	0	100	100
43	l	134/139 (96%)	132 (98%)	2 (2%)	0	100	100
44	m	117/124 (94%)	112 (96%)	5 (4%)	0	100	100
45	n	114/116 (98%)	109 (96%)	5 (4%)	0	100	100
46	o	116/119 (98%)	108 (93%)	8 (7%)	0	100	100
47	p	116/127 (91%)	114 (98%)	2 (2%)	0	100	100
48	q	97/100 (97%)	92 (95%)	5 (5%)	0	100	100
49	r	140/159 (88%)	137 (98%)	3 (2%)	0	100	100
50	s	93/237 (39%)	89 (96%)	4 (4%)	0	100	100
51	t	109/111 (98%)	102 (94%)	7 (6%)	0	100	100
52	u	99/104 (95%)	86 (87%)	9 (9%)	4 (4%)	2	18

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
53	v	62/65 (95%)	57 (92%)	5 (8%)	0	100	100
54	w	108/111 (97%)	102 (94%)	6 (6%)	0	100	100
55	x	85/97 (88%)	64 (75%)	21 (25%)	0	100	100
56	y	54/57 (95%)	53 (98%)	1 (2%)	0	100	100
57	z	48/53 (91%)	47 (98%)	1 (2%)	0	100	100
All	All	6255/7355 (85%)	5717 (91%)	478 (8%)	60 (1%)	16	49

All (60) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
12	D	67	GLU
12	D	69	ARG
12	D	212	ARG
12	D	216	LEU
13	E	81	GLN
13	E	143	LEU
14	F	151	ALA
24	P	54	LEU
11	U	39	GLY
11	U	126	ASP
11	U	163	VAL
52	u	9	LYS
52	u	11	ASP
52	u	17	SER
52	u	23	SER
11	C	81	GLN
11	C	182	PRO
14	F	9	ARG
14	F	15	PRO
14	F	79	ILE
22	N	4	ASP
27	S	37	LYS
11	U	3	TYR
11	U	24	GLU
11	U	81	GLN
11	U	154	VAL
11	U	155	LYS
9	A	49	ARG
9	A	219	ASN
13	E	163	MET

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Mol	Chain	Res	Type
14	F	12	LEU
19	K	56	LYS
11	U	27	LYS
11	U	30	LYS
37	f	12	LEU
9	A	54	ASP
10	B	216	ASN
13	E	55	ALA
14	F	153	MET
19	K	70	LEU
23	O	47	LYS
23	O	49	LYS
25	Q	37	SER
32	a	128	ILE
9	A	16	GLU
9	A	17	LEU
11	C	188	PRO
12	D	62	PHE
17	I	100	VAL
19	K	72	ASN
25	Q	35	LYS
11	U	157	ALA
11	U	181	PHE
13	E	82	VAL
11	U	50	TYR
33	b	230	PRO
9	A	198	VAL
10	B	46	VAL
19	K	57	LYS
19	K	55	PRO

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	0	40/41 (98%)	40 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	1	51/51 (100%)	51 (100%)	0	100	100
3	2	35/35 (100%)	35 (100%)	0	100	100
9	A	239/262 (91%)	238 (100%)	1 (0%)	89	91
10	B	188/232 (81%)	187 (100%)	1 (0%)	86	89
11	C	182/183 (100%)	178 (98%)	4 (2%)	47	65
11	U	182/183 (100%)	180 (99%)	2 (1%)	70	80
12	D	141/178 (79%)	139 (99%)	2 (1%)	62	75
13	E	150/196 (76%)	150 (100%)	0	100	100
14	F	132/132 (100%)	131 (99%)	1 (1%)	79	85
15	G	124/124 (100%)	122 (98%)	2 (2%)	58	73
16	H	112/115 (97%)	111 (99%)	1 (1%)	75	83
17	I	97/99 (98%)	96 (99%)	1 (1%)	73	82
18	J	91/97 (94%)	91 (100%)	0	100	100
19	K	117/120 (98%)	116 (99%)	1 (1%)	75	83
20	L	102/105 (97%)	101 (99%)	1 (1%)	73	82
21	M	47/48 (98%)	47 (100%)	0	100	100
22	N	78/78 (100%)	78 (100%)	0	100	100
23	O	76/82 (93%)	76 (100%)	0	100	100
24	P	75/75 (100%)	75 (100%)	0	100	100
25	Q	69/94 (73%)	69 (100%)	0	100	100
26	R	76/77 (99%)	76 (100%)	0	100	100
27	S	71/77 (92%)	71 (100%)	0	100	100
28	T	55/56 (98%)	55 (100%)	0	100	100
29	X	27/406 (7%)	26 (96%)	1 (4%)	29	49
31	Z	2/2 (100%)	2 (100%)	0	100	100
32	a	241/243 (99%)	240 (100%)	1 (0%)	89	91
33	b	188/233 (81%)	187 (100%)	1 (0%)	86	89
34	c	183/184 (100%)	183 (100%)	0	100	100
35	d	153/154 (99%)	152 (99%)	1 (1%)	81	87
36	e	153/159 (96%)	152 (99%)	1 (1%)	81	87
37	f	134/134 (100%)	134 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
38	g	100/129 (78%)	98 (98%)	2 (2%)	50	68
39	h	102/110 (93%)	102 (100%)	0	100	100
40	i	126/128 (98%)	125 (99%)	1 (1%)	79	85
41	j	103/103 (100%)	101 (98%)	2 (2%)	52	69
42	k	125/126 (99%)	125 (100%)	0	100	100
43	l	113/115 (98%)	112 (99%)	1 (1%)	75	83
44	m	105/109 (96%)	104 (99%)	1 (1%)	73	82
45	n	99/99 (100%)	99 (100%)	0	100	100
46	o	104/105 (99%)	104 (100%)	0	100	100
47	p	104/108 (96%)	104 (100%)	0	100	100
48	q	90/91 (99%)	90 (100%)	0	100	100
49	r	118/132 (89%)	118 (100%)	0	100	100
50	s	84/208 (40%)	84 (100%)	0	100	100
51	t	96/96 (100%)	96 (100%)	0	100	100
52	u	82/85 (96%)	82 (100%)	0	100	100
53	v	59/60 (98%)	59 (100%)	0	100	100
54	w	97/98 (99%)	97 (100%)	0	100	100
55	x	79/86 (92%)	78 (99%)	1 (1%)	65	77
56	y	48/49 (98%)	47 (98%)	1 (2%)	48	66
57	z	47/50 (94%)	47 (100%)	0	100	100
All	All	5492/6342 (87%)	5461 (99%)	31 (1%)	82	88

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
9	A	286	ARG
10	B	93	LYS
11	C	55	GLN
11	C	76	ARG
11	C	143	ARG
11	C	184	ARG
12	D	72	LYS
12	D	133	LYS
14	F	154	ARG
15	G	67	LYS

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Mol	Chain	Res	Type
15	G	132	LYS
16	H	70	LYS
17	I	59	ARG
19	K	124	ARG
20	L	78	LYS
11	U	31	ARG
11	U	202	ARG
29	X	36	LYS
32	a	84	LYS
33	b	151	ARG
35	d	45	ARG
36	e	174	ARG
38	g	50	LYS
38	g	125	LYS
40	i	132	LYS
41	j	7	ARG
41	j	91	LYS
43	l	60	LYS
44	m	30	LYS
55	x	32	LYS
56	y	54	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (44) such sidechains are listed below:

Mol	Chain	Res	Type
9	A	221	GLN
10	B	6	ASN
10	B	91	GLN
11	C	81	GLN
11	C	88	ASN
12	D	193	HIS
13	E	20	GLN
13	E	79	ASN
14	F	19	ASN
14	F	67	ASN
14	F	83	ASN
14	F	85	GLN
15	G	11	HIS
15	G	85	ASN
16	H	62	ASN
19	K	29	ASN
20	L	36	GLN

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Mol	Chain	Res	Type
20	L	100	GLN
22	N	13	GLN
24	P	49	ASN
27	S	63	ASN
11	U	37	GLN
11	U	53	GLN
11	U	88	ASN
11	U	171	ASN
33	b	34	ASN
33	b	144	GLN
33	b	188	ASN
35	d	63	GLN
36	e	33	GLN
37	f	96	GLN
40	i	80	HIS
41	j	18	GLN
41	j	69	GLN
42	k	24	HIS
43	l	99	GLN
43	l	113	GLN
45	n	49	ASN
45	n	66	ASN
45	n	69	ASN
46	o	17	GLN
48	q	2	HIS
52	u	100	HIS
53	v	34	GLN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
30	Y	28/29 (96%)	16 (57%)	4 (14%)
4	3	2891/2907 (99%)	537 (18%)	18 (0%)
5	4	107/108 (99%)	29 (27%)	0
6	5	1503/1520 (98%)	257 (17%)	10 (0%)
7	6	76/76 (100%)	23 (30%)	5 (6%)
8	7	74/75 (98%)	20 (27%)	2 (2%)
All	All	4679/4715 (99%)	882 (18%)	39 (0%)

All (882) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
4	3	11	U
4	3	12	A
4	3	13	C
4	3	14	U
4	3	28	G
4	3	37	G
4	3	48	G
4	3	64	U
4	3	65	A
4	3	73	A
4	3	76	A
4	3	77	G
4	3	102	A
4	3	103	G
4	3	119	A
4	3	121	U
4	3	126	C
4	3	132	G
4	3	141	A
4	3	142	A
4	3	163	A
4	3	180	A
4	3	184	A
4	3	187	C
4	3	200	A
4	3	203	A
4	3	219	G
4	3	220	A
4	3	225	A
4	3	226	A
4	3	232	A
4	3	234	G
4	3	237	A
4	3	245	U
4	3	246	G
4	3	252	G
4	3	269	A
4	3	276	A
4	3	284	U
4	3	287	G
4	3	295	U
4	3	296	U
4	3	297	G

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Mol	Chain	Res	Type
4	3	298	U
4	3	299	A
4	3	309	A
4	3	310	U
4	3	311	G
4	3	315	A
4	3	316	C
4	3	317	U
4	3	319	G
4	3	325	G
4	3	336	C
4	3	345	A
4	3	363	G
4	3	364	A
4	3	365	U
4	3	402	A
4	3	409	A
4	3	410	G
4	3	411	U
4	3	418	G
4	3	419	A
4	3	424	G
4	3	425	U
4	3	426	U
4	3	432	G
4	3	437	A
4	3	440	C
4	3	460	G
4	3	463	U
4	3	483	A
4	3	517	G
4	3	539	U
4	3	540	A
4	3	548	A
4	3	562	C
4	3	565	C
4	3	566	G
4	3	567	U
4	3	573	A
4	3	581	A
4	3	583	U
4	3	596	G

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Mol	Chain	Res	Type
4	3	598	G
4	3	607	U
4	3	608	A
4	3	610	G
4	3	620	G
4	3	636	U
4	3	637	U
4	3	638	A
4	3	648	G
4	3	649	A
4	3	650	G
4	3	663	A
4	3	670	G
4	3	673	A
4	3	681	A
4	3	682	A
4	3	689	U
4	3	691	G
4	3	705	A
4	3	712	A
4	3	716	G
4	3	721	G
4	3	722	C
4	3	765	A
4	3	775	C
4	3	782	U
4	3	792	G
4	3	797	U
4	3	800	C
4	3	810	G
4	3	811	G
4	3	817	A
4	3	819	U
4	3	820	U
4	3	824	A
4	3	828	A
4	3	829	A
4	3	840	G
4	3	846	U
4	3	847	C
4	3	854	A
4	3	862	U

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Mol	Chain	Res	Type
4	3	881	A
4	3	882	C
4	3	883	A
4	3	901	C
4	3	902	U
4	3	904	C
4	3	906	G
4	3	911	U
4	3	912	A
4	3	914	G
4	3	915	A
4	3	925	C
4	3	929	G
4	3	931	G
4	3	932	U
4	3	933	A
4	3	934	C
4	3	941	C
4	3	942	A
4	3	944	U
4	3	947	A
4	3	949	C
4	3	951	C
4	3	952	U
4	3	953	G
4	3	970	U
4	3	981	A
4	3	982	G
4	3	994	U
4	3	997	G
4	3	998	C
4	3	1008	A
4	3	1010	G
4	3	1016	A
4	3	1019	A
4	3	1026	A
4	3	1032	A
4	3	1039	G
4	3	1045	A
4	3	1049	U
4	3	1058	U
4	3	1060	G

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Mol	Chain	Res	Type
4	3	1061	A
4	3	1068	U
4	3	1074	A
4	3	1080	A
4	3	1082	A
4	3	1084	C
4	3	1096	U
4	3	1097	G
4	3	1098	G
4	3	1099	C
4	3	1102	A
4	3	1104	A
4	3	1105	A
4	3	1106	G
4	3	1107	C
4	3	1110	C
4	3	1111	C
4	3	1113	U
4	3	1114	C
4	3	1115	G
4	3	1120	A
4	3	1122	G
4	3	1123	A
4	3	1125	U
4	3	1130	A
4	3	1132	C
4	3	1138	A
4	3	1144	C
4	3	1145	G
4	3	1146	A
4	3	1147	G
4	3	1165	U
4	3	1167	U
4	3	1168	A
4	3	1170	C
4	3	1176	U
4	3	1177	A
4	3	1178	A
4	3	1204	A
4	3	1208	A
4	3	1209	U
4	3	1210	A

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Mol	Chain	Res	Type
4	3	1212	C
4	3	1215	G
4	3	1234	U
4	3	1235	U
4	3	1236	G
4	3	1242	G
4	3	1246	U
4	3	1250	A
4	3	1251	G
4	3	1253	G
4	3	1256	A
4	3	1257	G
4	3	1266	G
4	3	1268	U
4	3	1280	G
4	3	1281	A
4	3	1283	A
4	3	1285	U
4	3	1286	G
4	3	1292	A
4	3	1301	G
4	3	1304	U
4	3	1313	G
4	3	1325	C
4	3	1328	A
4	3	1329	U
4	3	1330	U
4	3	1369	U
4	3	1378	C
4	3	1380	U
4	3	1388	G
4	3	1393	A
4	3	1406	A
4	3	1407	U
4	3	1412	A
4	3	1423	A
4	3	1424	U
4	3	1431	A
4	3	1444	C
4	3	1445	U
4	3	1446	G
4	3	1448	U

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Mol	Chain	Res	Type
4	3	1456	C
4	3	1463	G
4	3	1467	U
4	3	1480	A
4	3	1481	U
4	3	1483	G
4	3	1486	U
4	3	1487	U
4	3	1502	A
4	3	1504	G
4	3	1508	G
4	3	1510	A
4	3	1513	A
4	3	1514	U
4	3	1515	A
4	3	1519	A
4	3	1522	U
4	3	1534	A
4	3	1535	A
4	3	1541	A
4	3	1546	U
4	3	1550	G
4	3	1569	A
4	3	1570	A
4	3	1571	G
4	3	1580	G
4	3	1582	G
4	3	1584	U
4	3	1585	A
4	3	1588	A
4	3	1589	A
4	3	1603	A
4	3	1612	U
4	3	1617	U
4	3	1618	U
4	3	1619	A
4	3	1641	A
4	3	1642	G
4	3	1643	A
4	3	1644	A
4	3	1645	C
4	3	1650	A

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Mol	Chain	Res	Type
4	3	1651	C
4	3	1661	A
4	3	1668	G
4	3	1680	A
4	3	1681	G
4	3	1682	C
4	3	1688	A
4	3	1694	A
4	3	1708	G
4	3	1727	U
4	3	1737	G
4	3	1748	U
4	3	1749	A
4	3	1764	U
4	3	1769	A
4	3	1770	A
4	3	1771	C
4	3	1780	A
4	3	1789	C
4	3	1791	A
4	3	1807	C
4	3	1808	C
4	3	1809	A
4	3	1816	A
4	3	1823	U
4	3	1836	A
4	3	1854	A
4	3	1855	A
4	3	1866	G
4	3	1869	G
4	3	1878	A
4	3	1886	C
4	3	1910	G
4	3	1913	G
4	3	1919	A
4	3	1920	A
4	3	1921	C
4	3	1922	U
4	3	1936	G
4	3	1937	G
4	3	1938	U
4	3	1943	A

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Mol	Chain	Res	Type
4	3	1944	A
4	3	1962	U
4	3	1974	U
4	3	1977	A
4	3	1978	U
4	3	1979	G
4	3	1998	U
4	3	1999	G
4	3	2000	U
4	3	2004	G
4	3	2028	G
4	3	2030	A
4	3	2038	A
4	3	2040	A
4	3	2041	C
4	3	2042	A
4	3	2050	G
4	3	2057	C
4	3	2062	C
4	3	2063	G
4	3	2067	A
4	3	2068	G
4	3	2069	A
4	3	2076	G
4	3	2084	A
4	3	2099	U
4	3	2100	G
4	3	2103	C
4	3	2106	G
4	3	2107	A
4	3	2108	C
4	3	2109	A
4	3	2111	U
4	3	2112	A
4	3	2113	U
4	3	2114	C
4	3	2118	U
4	3	2119	A
4	3	2123	A
4	3	2124	A
4	3	2125	U
4	3	2126	A

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Mol	Chain	Res	Type
4	3	2127	G
4	3	2128	G
4	3	2130	A
4	3	2134	G
4	3	2135	C
4	3	2138	U
4	3	2139	C
4	3	2140	G
4	3	2141	A
4	3	2145	A
4	3	2146	A
4	3	2152	C
4	3	2153	U
4	3	2157	A
4	3	2158	C
4	3	2163	U
4	3	2164	G
4	3	2165	A
4	3	2166	U
4	3	2167	G
4	3	2168	C
4	3	2169	G
4	3	2170	A
4	3	2171	A
4	3	2172	A
4	3	2173	G
4	3	2175	U
4	3	2179	A
4	3	2180	U
4	3	2181	A
4	3	2186	C
4	3	2190	G
4	3	2193	U
4	3	2194	G
4	3	2195	U
4	3	2196	G
4	3	2197	U
4	3	2198	G
4	3	2199	C
4	3	2200	U
4	3	2202	U
4	3	2207	A

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Mol	Chain	Res	Type
4	3	2211	G
4	3	2212	U
4	3	2219	U
4	3	2220	A
4	3	2221	U
4	3	2227	U
4	3	2228	U
4	3	2233	A
4	3	2246	G
4	3	2247	G
4	3	2259	OMG
4	3	2274	A
4	3	2276	A
4	3	2287	G
4	3	2291	U
4	3	2295	A
4	3	2298	G
4	3	2305	C
4	3	2311	G
4	3	2313	U
4	3	2316	G
4	3	2319	A
4	3	2327	U
4	3	2329	G
4	3	2333	G
4	3	2335	A
4	3	2336	A
4	3	2342	U
4	3	2343	A
4	3	2344	A
4	3	2353	G
4	3	2355	C
4	3	2358	U
4	3	2366	A
4	3	2391	G
4	3	2393	C
4	3	2397	G
4	3	2410	C
4	3	2411	C
4	3	2414	U
4	3	2422	G
4	3	2431	U

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Mol	Chain	Res	Type
4	3	2433	A
4	3	2437	G
4	3	2438	A
4	3	2443	A
4	3	2449	U
4	3	2456	A
4	3	2477	A
4	3	2481	U
4	3	2482	U
4	3	2483	C
4	3	2484	A
4	3	2486	A
4	3	2488	C
4	3	2499	U
4	3	2510	G
4	3	2512	U
4	3	2513	G
4	3	2521	A
4	3	2526	A
4	3	2537	G
4	3	2543	G
4	3	2574	A
4	3	2575	G
4	3	2580	A
4	3	2585	A
4	3	2593	U
4	3	2594	C
4	3	2605	G
4	3	2610	A
4	3	2617	U
4	3	2618	C
4	3	2621	U
4	3	2623	U
4	3	2637	A
4	3	2638	G
4	3	2654	U
4	3	2668	A
4	3	2669	G
4	3	2697	C
4	3	2698	U
4	3	2722	G
4	3	2734	C

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Mol	Chain	Res	Type
4	3	2737	G
4	3	2741	A
4	3	2752	G
4	3	2756	A
4	3	2760	C
4	3	2764	U
4	3	2765	A
4	3	2773	A
4	3	2786	A
4	3	2798	A
4	3	2799	U
4	3	2804	C
4	3	2806	A
4	3	2807	G
4	3	2808	A
4	3	2810	A
4	3	2813	A
4	3	2822	C
4	3	2824	A
4	3	2829	G
4	3	2839	A
4	3	2853	U
4	3	2862	U
4	3	2863	G
4	3	2871	G
4	3	2876	G
4	3	2884	C
4	3	2887	A
4	3	2888	U
4	3	2895	A
4	3	2896	G
4	3	2899	C
5	4	9	C
5	4	10	C
5	4	11	A
5	4	13	G
5	4	14	U
5	4	22	G
5	4	23	A
5	4	28	C
5	4	33	U
5	4	35	C

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Mol	Chain	Res	Type
5	4	39	U
5	4	41	C
5	4	48	A
5	4	49	G
5	4	54	U
5	4	56	A
5	4	60	C
5	4	64	G
5	4	65	G
5	4	80	G
5	4	82	U
5	4	83	U
5	4	84	C
5	4	85	A
5	4	88	G
5	4	89	A
5	4	99	A
5	4	106	A
5	4	108	C
6	5	6	C
6	5	10	G
6	5	33	A
6	5	40	G
6	5	48	C
6	5	49	C
6	5	52	A
6	5	57	U
6	5	61	A
6	5	106	C
6	5	114	C
6	5	115	A
6	5	117	U
6	5	120	A
6	5	149	G
6	5	154	G
6	5	163	G
6	5	167	A
6	5	171	A
6	5	173	U
6	5	176	G
6	5	180	C
6	5	182	C

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Mol	Chain	Res	Type
6	5	185	G
6	5	186	A
6	5	189	C
6	5	190	A
6	5	197	A
6	5	198	A
6	5	199	A
6	5	220	U
6	5	223	G
6	5	239	A
6	5	241	C
6	5	243	G
6	5	247	G
6	5	262	G
6	5	263	C
6	5	269	A
6	5	275	A
6	5	285	G
6	5	301	G
6	5	302	A
6	5	324	C
6	5	325	A
6	5	326	C
6	5	328	G
6	5	341	C
6	5	342	G
6	5	344	G
6	5	347	G
6	5	348	C
6	5	350	G
6	5	359	A
6	5	362	U
6	5	363	U
6	5	364	U
6	5	365	U
6	5	368	C
6	5	369	A
6	5	370	A
6	5	374	G
6	5	380	G
6	5	383	U
6	5	388	G

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Mol	Chain	Res	Type
6	5	394	U
6	5	402	G
6	5	408	U
6	5	416	U
6	5	418	U
6	5	419	A
6	5	422	A
6	5	425	G
6	5	426	U
6	5	447	G
6	5	449	A
6	5	450	U
6	5	452	A
6	5	461	G
6	5	462	G
6	5	464	A
6	5	468	G
6	5	470	U
6	5	475	U
6	5	476	U
6	5	477	U
6	5	480	C
6	5	481	U
6	5	482	G
6	5	488	U
6	5	489	U
6	5	493	A
6	5	494	A
6	5	495	U
6	5	507	A
6	5	509	C
6	5	510	U
6	5	516	C
6	5	517	C
6	5	522	G
6	5	525	7MG
6	5	530	A
6	5	531	A
6	5	545	A
6	5	557	A
6	5	560	U
6	5	562	U

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Mol	Chain	Res	Type
6	5	570	A
6	5	571	A
6	5	574	C
6	5	575	A
6	5	579	G
6	5	586	G
6	5	594	A
6	5	595	G
6	5	628	A
6	5	650	A
6	5	661	G
6	5	662	G
6	5	683	G
6	5	700	G
6	5	715	A
6	5	719	G
6	5	720	U
6	5	721	G
6	5	728	G
6	5	745	U
6	5	752	G
6	5	768	G
6	5	790	U
6	5	791	A
6	5	811	A
6	5	812	A
6	5	814	C
6	5	818	A
6	5	825	A
6	5	829	G
6	5	836	C
6	5	838	A
6	5	839	U
6	5	867	A
6	5	883	A
6	5	885	U
6	5	908	A
6	5	910	C
6	5	911	G
6	5	921	G
6	5	922	G
6	5	929	C

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Mol	Chain	Res	Type
6	5	930	A
6	5	955	U
6	5	964	A
6	5	970	A
6	5	971	A
6	5	972	A
6	5	982	A
6	5	987	U
6	5	988	G
6	5	989	A
6	5	994	C
6	5	995	U
6	5	996	U
6	5	997	G
6	5	998	G
6	5	999	C
6	5	1000	A
6	5	1002	A
6	5	1007	U
6	5	1009	G
6	5	1015	U
6	5	1018	U
6	5	1019	G
6	5	1020	G
6	5	1022	G
6	5	1023	G
6	5	1024	U
6	5	1025	U
6	5	1027	A
6	5	1028	C
6	5	1029	C
6	5	1030	G
6	5	1032	G
6	5	1034	G
6	5	1036	C
6	5	1044	G
6	5	1045	C
6	5	1047	U
6	5	1056	U
6	5	1072	G
6	5	1076	U
6	5	1078	G

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Mol	Chain	Res	Type
6	5	1083	A
6	5	1085	G
6	5	1086	U
6	5	1092	A
6	5	1118	A
6	5	1121	U
6	5	1122	U
6	5	1123	G
6	5	1124	U
6	5	1134	C
6	5	1135	U
6	5	1141	U
6	5	1142	G
6	5	1158	A
6	5	1159	A
6	5	1170	C
6	5	1171	A
6	5	1172	A
6	5	1188	A
6	5	1189	U
6	5	1202	A
6	5	1203	A
6	5	1215	U
6	5	1231	U
6	5	1232	C
6	5	1233	G
6	5	1235	C
6	5	1255	A
6	5	1260	U
6	5	1271	U
6	5	1274	G
6	5	1279	G
6	5	1291	C
6	5	1294	U
6	5	1296	C
6	5	1297	G
6	5	1306	A
6	5	1312	G
6	5	1320	A
6	5	1321	G
6	5	1337	U
6	5	1338	A

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Mol	Chain	Res	Type
6	5	1339	U
6	5	1343	G
6	5	1345	G
6	5	1372	C
6	5	1373	A
6	5	1397	G
6	5	1417	U
6	5	1426	U
6	5	1427	U
6	5	1428	A
6	5	1429	G
6	5	1462	G
6	5	1467	A
6	5	1468	A
6	5	1472	G
6	5	1478	A
6	5	1480	G
6	5	1481	U
6	5	1482	A
6	5	1492	G
6	5	1504	G
6	5	1505	G
6	5	1510	C
6	5	1511	C
7	6	2	G
7	6	3	G
7	6	13	C
7	6	15	A
7	6	16	C
7	6	17	U
7	6	18	G
7	6	19	A
7	6	20	U
7	6	21	A
7	6	33	U
7	6	34	U
7	6	37	A
7	6	46	G
7	6	47	U
7	6	48	U
7	6	59	G
7	6	65	U

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Mol	Chain	Res	Type
7	6	70	U
7	6	71	C
7	6	72	C
7	6	73	A
7	6	75	C
8	7	4	U
8	7	11	U
8	7	13	U
8	7	15	G
8	7	16	U
8	7	17	G
8	7	19	A
8	7	20	U
8	7	21	A
8	7	22	A
8	7	34	G
8	7	44	G
8	7	46	U
8	7	47	U
8	7	48	G
8	7	51	G
8	7	57	A
8	7	71	C
8	7	73	C
8	7	75	A
30	Y	29	A
30	Y	31	A
30	Y	32	A
30	Y	34	A
30	Y	35	C
30	Y	36	U
30	Y	37	G
30	Y	40	G
30	Y	47	U
30	Y	49	U
30	Y	50	U
30	Y	51	C
30	Y	52	A
30	Y	53	A
30	Y	54	A
30	Y	56	A

All (39) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
4	3	315	A
4	3	410	G
4	3	881	A
4	3	901	C
4	3	1124	G
4	3	1209	U
4	3	1583	G
4	3	1618	U
4	3	2107	A
4	3	2110	U
4	3	2124	A
4	3	2152	C
4	3	2164	G
4	3	2169	G
4	3	2180	U
4	3	2199	C
4	3	2410	C
4	3	2764	U
6	5	196	G
6	5	363	U
6	5	364	U
6	5	571	A
6	5	994	C
6	5	995	U
6	5	1024	U
6	5	1123	G
6	5	1158	A
6	5	1338	A
7	6	1	G
7	6	15	A
7	6	33	U
7	6	46	G
7	6	74	C
8	7	10	G
8	7	46	U
30	Y	34	A
30	Y	35	C
30	Y	49	U
30	Y	51	C

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

8 non-standard protein/DNA/RNA residues are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	OMG	3	2259	8,4	18,26,27	0.99	2 (11%)	19,38,41	0.71	0
4	2MA	3	2511	61,4	17,25,26	6.17	10 (58%)	17,37,40	1.54	3 (17%)
6	7MG	5	525	6	22,26,27	3.89	10 (45%)	29,39,42	2.03	9 (31%)
6	MA6	5	1493	6	18,26,27	1.06	2 (11%)	19,38,41	3.31	3 (15%)
4	1MG	3	783	4	18,26,27	0.94	1 (5%)	19,39,42	0.81	0
6	MA6	5	1494	6	18,26,27	1.06	2 (11%)	19,38,41	3.37	3 (15%)
6	5MC	5	1375	6	18,22,23	0.34	0	26,32,35	0.69	2 (7%)
6	B8T	5	1377	6	19,22,23	4.71	13 (68%)	26,31,34	0.97	1 (3%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	OMG	3	2259	8,4	-	3/5/27/28	0/3/3/3
4	2MA	3	2511	61,4	-	2/3/25/26	0/3/3/3
6	7MG	5	525	6	-	2/7/37/38	0/3/3/3
6	MA6	5	1493	6	-	0/7/29/30	0/3/3/3
4	1MG	3	783	4	-	0/3/25/26	0/3/3/3
6	MA6	5	1494	6	-	2/7/29/30	0/3/3/3
6	5MC	5	1375	6	-	0/7/25/26	0/2/2/2
6	B8T	5	1377	6	-	0/7/27/28	0/2/2/2

All (40) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	3	2511	2MA	C2'-C1'	-15.49	1.30	1.53
4	3	2511	2MA	O4'-C1'	15.36	1.62	1.41
6	5	525	7MG	C8-N9	9.90	1.51	1.46
6	5	1377	B8T	O4'-C1'	8.89	1.63	1.42
4	3	2511	2MA	C2-N3	7.94	1.48	1.31

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	5	525	7MG	C5-N7	7.90	1.44	1.35
6	5	1377	B8T	O4'-C4'	-7.64	1.27	1.45
6	5	1377	B8T	C2'-C1'	-7.36	1.30	1.53
6	5	1377	B8T	C4-N3	7.33	1.45	1.32
6	5	1377	B8T	C2-N3	6.44	1.49	1.36
4	3	2511	2MA	O4'-C4'	-6.00	1.31	1.45
6	5	525	7MG	C2-N3	5.90	1.47	1.33
6	5	1377	B8T	C6-C5	5.81	1.48	1.35
6	5	525	7MG	C4-N9	5.80	1.44	1.37
6	5	525	7MG	C4-N3	5.59	1.47	1.34
4	3	2511	2MA	C4-N3	5.19	1.50	1.37
6	5	525	7MG	C2-N2	4.78	1.45	1.34
6	5	1377	B8T	C4-N4	4.67	1.45	1.35
6	5	1377	B8T	C2-N1	4.35	1.49	1.40
6	5	525	7MG	C2-N1	3.83	1.47	1.37
6	5	1377	B8T	C5-C4	3.77	1.48	1.40
6	5	1377	B8T	O2'-C2'	3.65	1.51	1.43
6	5	525	7MG	C5-C6	3.63	1.52	1.43
6	5	525	7MG	C6-N1	3.42	1.45	1.38
4	3	2511	2MA	C6-N1	3.14	1.44	1.38
6	5	1377	B8T	C6-N1	3.04	1.45	1.38
6	5	1377	B8T	O3'-C3'	-2.93	1.36	1.43
4	3	2511	2MA	C2-N1	2.72	1.45	1.36
4	3	2511	2MA	O3'-C3'	-2.71	1.36	1.43
4	3	2511	2MA	O2'-C2'	2.68	1.49	1.43
6	5	1493	MA6	C2-N3	2.67	1.36	1.32
6	5	1377	B8T	O2-C2	-2.66	1.18	1.23
4	3	2259	OMG	C5-C6	-2.62	1.42	1.47
6	5	1494	MA6	C2-N3	2.61	1.36	1.32
6	5	525	7MG	O6-C6	-2.44	1.18	1.23
6	5	1494	MA6	C5-C4	-2.31	1.34	1.40
6	5	1493	MA6	C5-C4	-2.23	1.35	1.40
4	3	783	1MG	C5-C4	-2.20	1.37	1.43
4	3	2511	2MA	C5-C4	-2.14	1.37	1.43
4	3	2259	OMG	C8-N7	-2.07	1.31	1.35

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	5	1494	MA6	N1-C6-N6	-12.24	104.18	117.06
6	5	1493	MA6	N1-C6-N6	-11.86	104.57	117.06
6	5	1494	MA6	N3-C2-N1	-5.64	119.86	128.68

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	5	1493	MA6	C1'-N9-C4	5.54	136.38	126.64
6	5	1493	MA6	N3-C2-N1	-5.54	120.02	128.68
6	5	1494	MA6	C1'-N9-C4	5.25	135.87	126.64
6	5	525	7MG	C5-C6-N1	4.96	119.74	110.99
6	5	525	7MG	C2-N3-C4	4.48	120.28	112.30
6	5	525	7MG	C5-C4-N3	-4.13	120.26	128.13
4	3	2511	2MA	C5-C6-N1	3.32	119.74	114.02
4	3	2511	2MA	C3'-C2'-C1'	3.26	105.88	100.98
6	5	525	7MG	C5-C4-N9	3.13	110.42	106.35
6	5	525	7MG	C4-C5-N7	3.04	109.75	105.53
6	5	525	7MG	C2-N1-C6	-2.85	119.90	125.10
6	5	525	7MG	O6-C6-C5	-2.77	120.75	127.54
6	5	525	7MG	N9-C4-N3	2.58	129.32	125.47
4	3	2511	2MA	C8-N7-C5	2.56	107.87	102.99
6	5	525	7MG	N9-C8-N7	2.27	106.62	103.38
6	5	1377	B8T	C6-C5-C4	2.13	119.57	116.96
6	5	1375	5MC	C5-C6-N1	-2.09	121.19	123.34
6	5	1375	5MC	O3'-C3'-C2'	-2.00	105.35	111.82

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	3	2259	OMG	C1'-C2'-O2'-CM2
6	5	525	7MG	O4'-C4'-C5'-O5'
6	5	525	7MG	C3'-C4'-C5'-O5'
6	5	1494	MA6	O4'-C4'-C5'-O5'
6	5	1494	MA6	C3'-C4'-C5'-O5'
4	3	2511	2MA	C3'-C4'-C5'-O5'
4	3	2259	OMG	O4'-C4'-C5'-O5'
4	3	2511	2MA	O4'-C4'-C5'-O5'
4	3	2259	OMG	C3'-C4'-C5'-O5'

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry

Of 316 ligands modelled in this entry, 315 are monoatomic - leaving 1 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
59	CLM	3	3001	-	19,20,20	2.08	2 (10%)	23,27,27	0.84	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
59	CLM	3	3001	-	-	2/20/22/22	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
59	3	3001	CLM	C2-N2	7.25	1.50	1.34
59	3	3001	CLM	O9B-N9	-2.65	1.18	1.22

There are no bond angle outliers.

There are no chirality outliers.

All (2) torsion outliers are listed below:

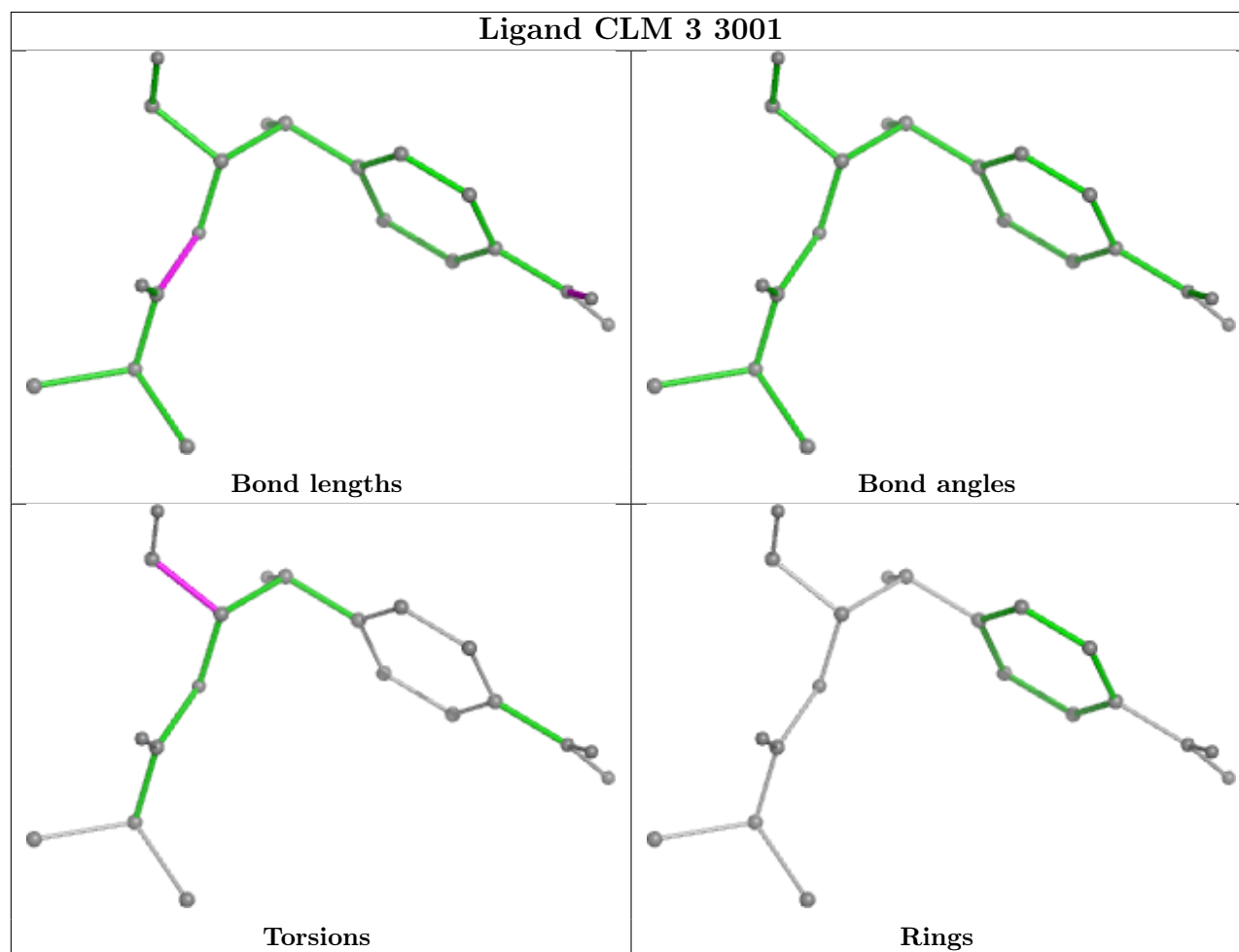
Mol	Chain	Res	Type	Atoms
59	3	3001	CLM	C5-C3-C4-O4
59	3	3001	CLM	N2-C3-C4-O4

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will

also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.