



## Full wwPDB EM Validation Report ⓘ

Jan 14, 2024 – 12:13 AM JST

PDB ID : 8IYK  
EMDB ID : EMD-35824  
Title : Tail tip conformation 1 of phage lambda tail  
Authors : Wang, J.W.; Wang, C.  
Deposited on : 2023-04-05  
Resolution : 2.95 Å (reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

EMDB validation analysis : **FAILED**  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : **FAILED**  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

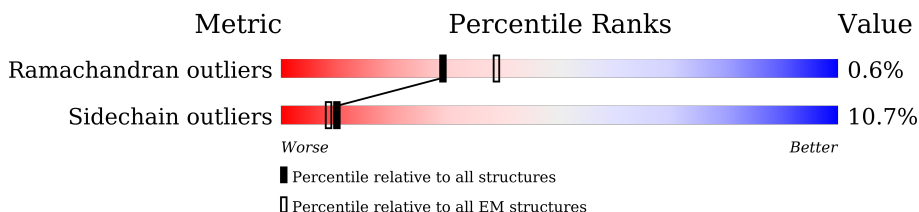
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 2.95 Å.

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



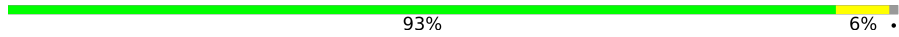









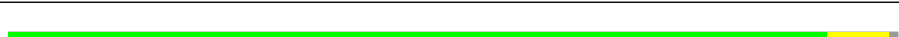


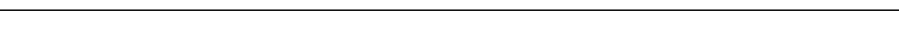
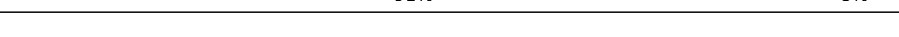
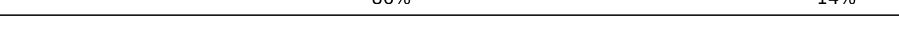
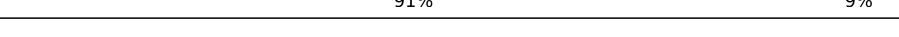


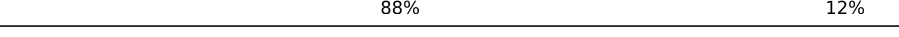
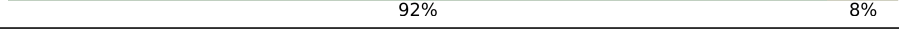



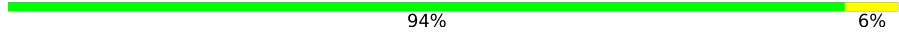
Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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	246	
1	B	246	
1	C	246	
1	D	246	
1	G	246	
1	Q	246	
1	R	246	
1	S	246	
1	T	246	
1	U	246	

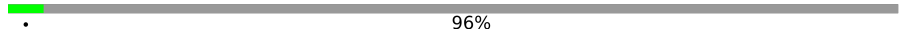
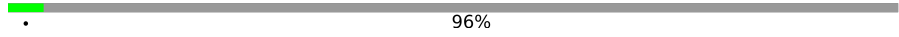
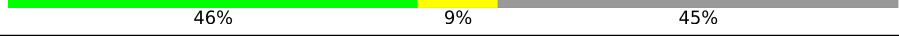
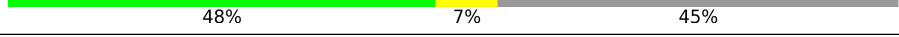
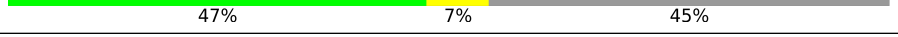
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Mol	Chain	Length	Quality of chain
1	V	246	 93% 6%
1	W	246	 91% 8%
1	X	246	 90% 9%
1	a	246	 91% 9%
1	b	246	 91% 9%
1	c	246	 91% 9%
1	d	246	 91% 7%
1	i	246	 88% 11%
1	j	246	 90% 9%
1	k	246	 89% 10%
1	l	246	 92% 7%
1	n	246	 87% 12%
1	o	246	 91% 8%
1	v	246	 91% 8%
2	E	109	 86% 14%
2	K	109	 91% 9%
2	M	109	 85% 15%
2	Y	109	 85% 15%
2	e	109	 88% 12%
2	m	109	 92% 8%
3	F	1132	 68% 8% 24%
3	J	1132	 69% 7% 24%
3	Z	1132	 70% 7% 24%
4	L	232	 94% 6%
4	N	232	 96%

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Mol	Chain	Length	Quality of chain
4	f	232	 94% 6%
5	H	853	 96%
5	O	853	 96%
5	g	853	 96%
6	I	223	 46% 9% 45%
6	P	223	 48% 7% 45%
6	h	223	 47% 7% 45%

## 2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 77370 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 Tail tube protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	V	243	1792	1119	302	366	5	0	0
1	v	243	1792	1119	302	366	5	0	0
1	B	244	1799	1124	303	367	5	0	0
1	b	244	1799	1124	303	367	5	0	0
1	A	244	1799	1124	303	367	5	0	0
1	a	244	1799	1124	303	367	5	0	0
1	C	244	1799	1124	303	367	5	0	0
1	c	244	1799	1124	303	367	5	0	0
1	D	243	1792	1119	302	366	5	0	0
1	G	243	1792	1119	302	366	5	0	0
1	Q	244	1799	1124	303	367	5	0	0
1	R	244	1799	1124	303	367	5	0	0
1	S	244	1799	1124	303	367	5	0	0
1	T	244	1799	1124	303	367	5	0	0
1	U	244	1799	1124	303	367	5	0	0
1	W	244	1799	1124	303	367	5	0	0
1	X	243	1792	1119	302	366	5	0	0

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Mol	Chain	Residues	Atoms					AltConf	Trace
1	d	243	Total	C	N	O	S	0	0
			1792	1119	302	366	5		
1	i	244	Total	C	N	O	S	0	0
			1799	1124	303	367	5		
1	j	244	Total	C	N	O	S	0	0
			1799	1124	303	367	5		
1	k	244	Total	C	N	O	S	0	0
			1799	1124	303	367	5		
1	l	244	Total	C	N	O	S	0	0
			1799	1124	303	367	5		
1	n	244	Total	C	N	O	S	0	0
			1799	1124	303	367	5		
1	o	244	Total	C	N	O	S	0	0
			1799	1124	303	367	5		

- Molecule 2 is a protein called Tail tip protein M.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	M	109	Total	C	N	O	S	0	0
			884	569	154	157	4		
2	m	109	Total	C	N	O	S	0	0
			884	569	154	157	4		
2	E	109	Total	C	N	O	S	0	0
			884	569	154	157	4		
2	K	109	Total	C	N	O	S	0	0
			884	569	154	157	4		
2	Y	109	Total	C	N	O	S	0	0
			884	569	154	157	4		
2	e	109	Total	C	N	O	S	0	0
			884	569	154	157	4		

- Molecule 3 is a protein called Tip attachment protein J.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	J	861	Total	C	N	O	S	0	0
			6720	4212	1171	1317	20		
3	F	861	Total	C	N	O	S	0	0
			6720	4212	1171	1317	20		
3	Z	861	Total	C	N	O	S	0	0
			6720	4212	1171	1317	20		

- Molecule 4 is a protein called Tail tip protein L.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	L	232	Total	C	N	O	S	0	0
			1801	1117	309	362	13		
4	N	232	Total	C	N	O	S	0	0
			1801	1117	309	362	13		
4	f	232	Total	C	N	O	S	0	0
			1801	1117	309	362	13		

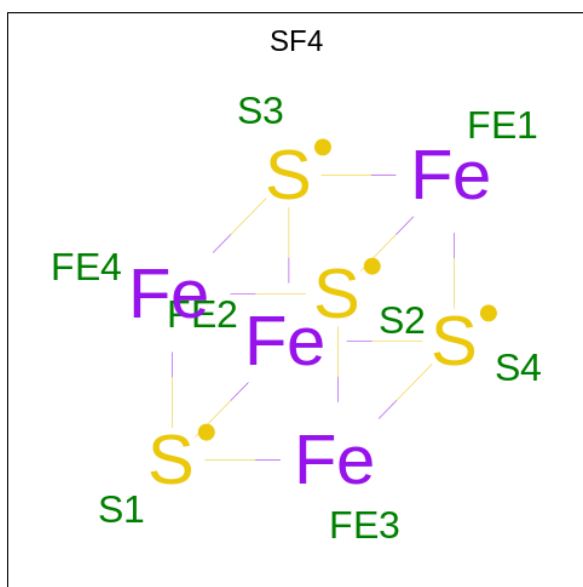
- Molecule 5 is a protein called Tape measure protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	H	33	Total	C	N	O	S	0	0
			250	154	47	47	2		
5	O	33	Total	C	N	O	S	0	0
			250	154	47	47	2		
5	g	33	Total	C	N	O	S	0	0
			250	154	47	47	2		

- Molecule 6 is a protein called Tail tip assembly protein I.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	I	122	Total	C	N	O	S	0	0
			865	544	151	165	5		
6	P	122	Total	C	N	O	S	0	0
			865	544	151	165	5		
6	h	122	Total	C	N	O	S	0	0
			865	544	151	165	5		

- Molecule 7 is IRON/SULFUR CLUSTER (three-letter code: SF4) (formula: Fe<sub>4</sub>S<sub>4</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
			Total	Fe	S	
7	L	1	8	4	4	0
7	N	1	8	4	4	0
7	f	1	8	4	4	0



### 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: Tail tube protein

Chain V:  93% 6%




- Molecule 1: Tail tube protein

Chain v:  91% 8%




- Molecule 1: Tail tube protein

Chain B:  88% 11%



- Molecule 1: Tail tube protein

Chain b:  91% 9%



- Molecule 1: Tail tube protein

Chain A:  91% 8%

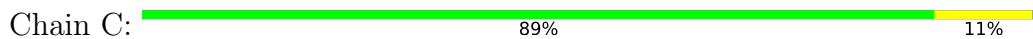


- Molecule 1: Tail tube protein

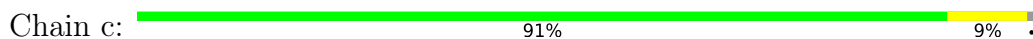
Chain a:  91% 9%



• Molecule 1: Tail tube protein



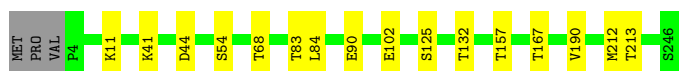
• Molecule 1: Tail tube protein



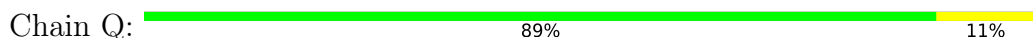
• Molecule 1: Tail tube protein



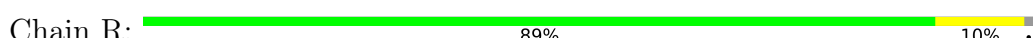
• Molecule 1: Tail tube protein



• Molecule 1: Tail tube protein



• Molecule 1: Tail tube protein



• Molecule 1: Tail tube protein

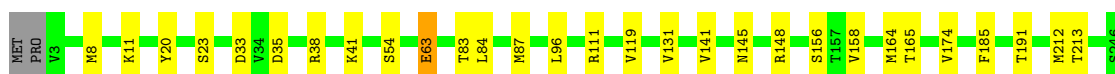
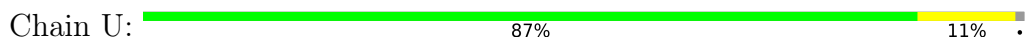




- Molecule 1: Tail tube protein



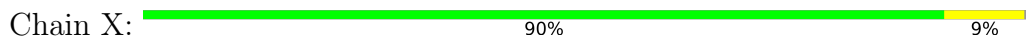
- Molecule 1: Tail tube protein



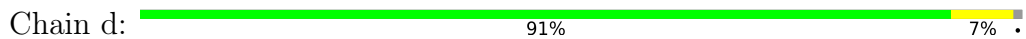
- Molecule 1: Tail tube protein



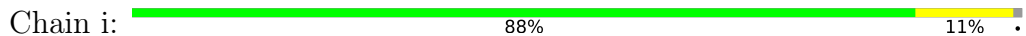
- Molecule 1: Tail tube protein



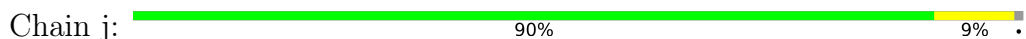
- Molecule 1: Tail tube protein



- Molecule 1: Tail tube protein

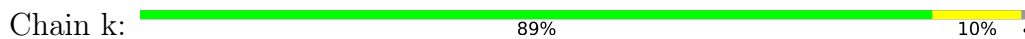


- Molecule 1: Tail tube protein

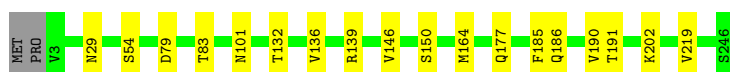
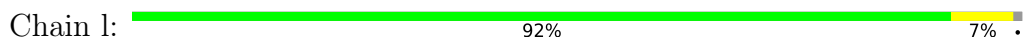




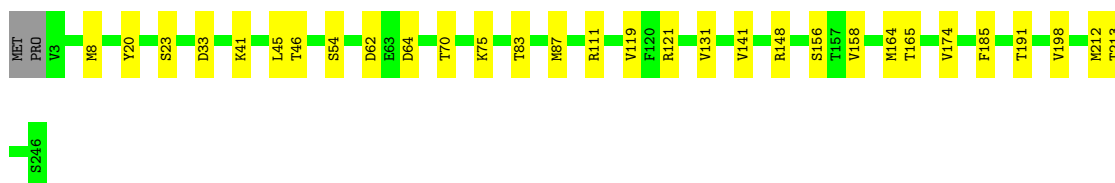
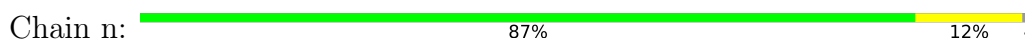
• Molecule 1: Tail tube protein



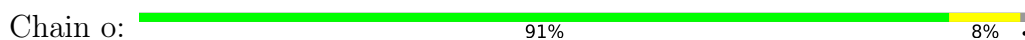
• Molecule 1: Tail tube protein



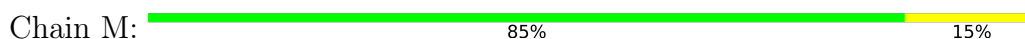
• Molecule 1: Tail tube protein



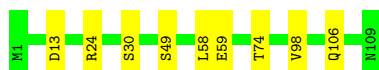
• Molecule 1: Tail tube protein



• Molecule 2: Tail tip protein M

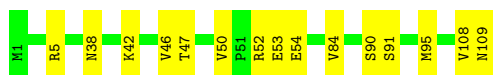


• Molecule 2: Tail tip protein M



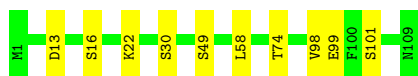
• Molecule 2: Tail tip protein M

Chain E:   86% 14%



• Molecule 2: Tail tip protein M

Chain K:   91% 9%



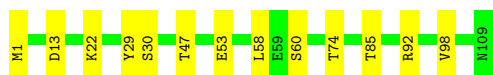
• Molecule 2: Tail tip protein M

Chain Y:   85% 15%



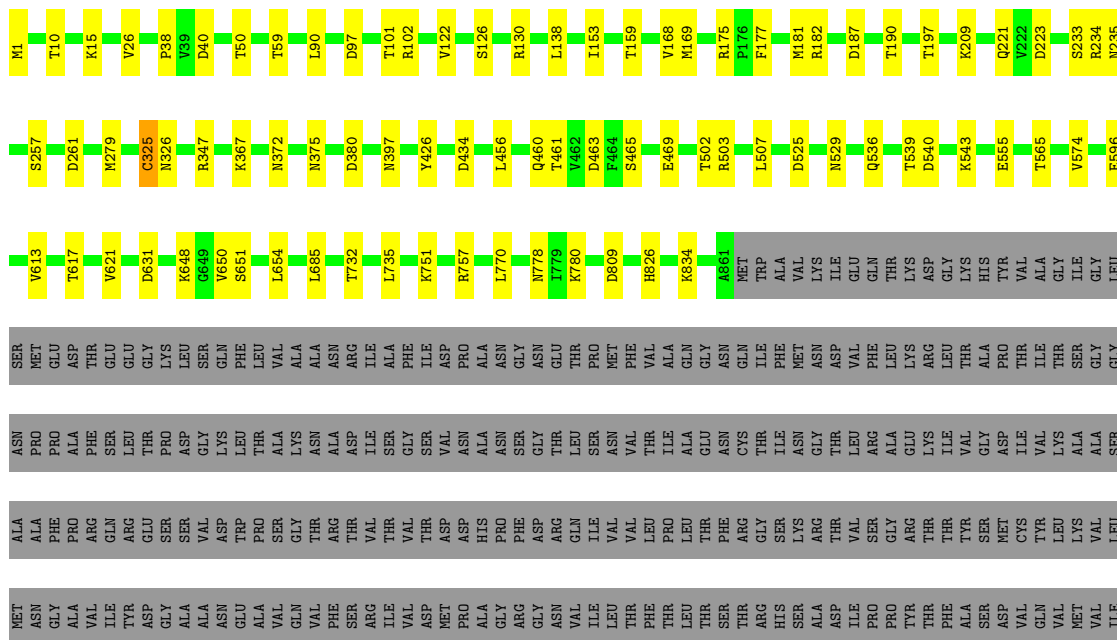
• Molecule 2: Tail tip protein M

Chain e:   88% 12%



• Molecule 3: Tip attachment protein J

Chain J:    69% 7% 24%





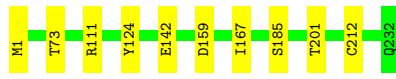
• Molecule 4: Tail tip protein L

Chain L:  94% 6%



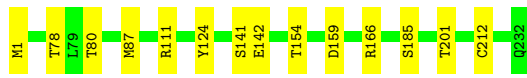
• Molecule 4: Tail tip protein L

Chain N:  96% 1%



• Molecule 4: Tail tip protein L

Chain f:  94% 6%



• Molecule 5: Tape measure protein

Chain H:  96% 4%

Table of amino acid sequences for Chain H, showing 10 rows of residues.









## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	57290	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	50	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor

## 5 Model quality [i](#)

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

Bond lengths and bond angles in the following residue types are not validated in this section: SF4

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	A	0.25	0/1834	0.53	0/2505
1	B	0.26	0/1834	0.54	0/2505
1	C	0.28	0/1834	0.58	0/2505
1	D	0.25	0/1827	0.51	0/2494
1	G	0.26	0/1827	0.54	0/2494
1	Q	0.26	0/1834	0.53	0/2505
1	R	0.25	0/1834	0.53	0/2505
1	S	0.25	0/1834	0.51	0/2505
1	T	0.26	0/1834	0.53	0/2505
1	U	0.28	0/1834	0.57	0/2505
1	V	0.25	0/1827	0.51	0/2494
1	W	0.27	0/1834	0.54	0/2505
1	X	0.26	0/1827	0.52	0/2494
1	a	0.26	0/1834	0.51	0/2505
1	b	0.27	0/1834	0.53	0/2505
1	c	0.27	0/1834	0.55	0/2505
1	d	0.26	0/1827	0.54	0/2494
1	i	0.26	0/1834	0.53	0/2505
1	j	0.26	0/1834	0.51	0/2505
1	k	0.26	0/1834	0.53	0/2505
1	l	0.26	0/1834	0.52	0/2505
1	n	0.27	0/1834	0.56	0/2505
1	o	0.26	0/1834	0.54	0/2505
1	v	0.27	0/1827	0.52	0/2494
2	E	0.28	0/909	0.58	0/1231
2	K	0.26	0/909	0.55	0/1231
2	M	0.27	0/909	0.57	0/1231
2	Y	0.28	0/909	0.57	0/1231
2	e	0.26	0/909	0.55	0/1231
2	m	0.26	0/909	0.54	0/1231
3	F	0.26	0/6866	0.54	0/9348
3	J	0.26	0/6866	0.54	0/9348

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
3	Z	0.26	0/6866	0.54	0/9348
4	L	0.26	0/1836	0.50	0/2487
4	N	0.26	0/1836	0.49	0/2487
4	f	0.26	0/1836	0.50	0/2487
5	H	0.25	0/252	0.49	0/335
5	O	0.26	0/252	0.53	0/335
5	g	0.26	0/252	0.49	0/335
6	I	0.31	0/876	0.63	0/1186
6	P	0.31	0/876	0.59	0/1186
6	h	0.26	0/876	0.55	0/1186
All	All	0.26	0/78918	0.54	0/107508

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
3	F	0	1
3	J	0	1
3	Z	0	1
All	All	0	3

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	F	175	ARG	Peptide
3	J	175	ARG	Peptide
3	Z	175	ARG	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	A	242/246 (98%)	224 (93%)	15 (6%)	3 (1%)	13	43
1	B	242/246 (98%)	226 (93%)	15 (6%)	1 (0%)	34	69
1	C	242/246 (98%)	221 (91%)	19 (8%)	2 (1%)	19	53
1	D	241/246 (98%)	226 (94%)	14 (6%)	1 (0%)	34	69
1	G	241/246 (98%)	226 (94%)	15 (6%)	0	100	100
1	Q	242/246 (98%)	224 (93%)	17 (7%)	1 (0%)	34	69
1	R	242/246 (98%)	231 (96%)	11 (4%)	0	100	100
1	S	242/246 (98%)	224 (93%)	15 (6%)	3 (1%)	13	43
1	T	242/246 (98%)	233 (96%)	9 (4%)	0	100	100
1	U	242/246 (98%)	222 (92%)	17 (7%)	3 (1%)	13	43
1	V	241/246 (98%)	228 (95%)	12 (5%)	1 (0%)	34	69
1	W	242/246 (98%)	231 (96%)	10 (4%)	1 (0%)	34	69
1	X	241/246 (98%)	228 (95%)	12 (5%)	1 (0%)	34	69
1	a	242/246 (98%)	231 (96%)	11 (4%)	0	100	100
1	b	242/246 (98%)	226 (93%)	15 (6%)	1 (0%)	34	69
1	c	242/246 (98%)	230 (95%)	11 (4%)	1 (0%)	34	69
1	d	241/246 (98%)	228 (95%)	13 (5%)	0	100	100
1	i	242/246 (98%)	225 (93%)	16 (7%)	1 (0%)	34	69
1	j	242/246 (98%)	225 (93%)	17 (7%)	0	100	100
1	k	242/246 (98%)	225 (93%)	14 (6%)	3 (1%)	13	43
1	l	242/246 (98%)	231 (96%)	11 (4%)	0	100	100
1	n	242/246 (98%)	222 (92%)	19 (8%)	1 (0%)	34	69
1	o	242/246 (98%)	231 (96%)	10 (4%)	1 (0%)	34	69
1	v	241/246 (98%)	225 (93%)	13 (5%)	3 (1%)	13	43
2	E	107/109 (98%)	93 (87%)	13 (12%)	1 (1%)	17	51

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	K	107/109 (98%)	91 (85%)	16 (15%)	0	100	100
2	M	107/109 (98%)	93 (87%)	14 (13%)	0	100	100
2	Y	107/109 (98%)	93 (87%)	14 (13%)	0	100	100
2	e	107/109 (98%)	93 (87%)	14 (13%)	0	100	100
2	m	107/109 (98%)	95 (89%)	12 (11%)	0	100	100
3	F	859/1132 (76%)	780 (91%)	73 (8%)	6 (1%)	22	56
3	J	859/1132 (76%)	776 (90%)	77 (9%)	6 (1%)	22	56
3	Z	859/1132 (76%)	779 (91%)	76 (9%)	4 (0%)	29	64
4	L	230/232 (99%)	221 (96%)	9 (4%)	0	100	100
4	N	230/232 (99%)	222 (96%)	8 (4%)	0	100	100
4	f	230/232 (99%)	222 (96%)	8 (4%)	0	100	100
5	H	31/853 (4%)	27 (87%)	4 (13%)	0	100	100
5	O	31/853 (4%)	26 (84%)	5 (16%)	0	100	100
5	g	31/853 (4%)	26 (84%)	5 (16%)	0	100	100
6	I	120/223 (54%)	101 (84%)	15 (12%)	4 (3%)	4	18
6	P	120/223 (54%)	101 (84%)	14 (12%)	5 (4%)	3	13
6	h	120/223 (54%)	100 (83%)	16 (13%)	4 (3%)	4	18
All	All	10164/13878 (73%)	9382 (92%)	724 (7%)	58 (1%)	29	60

All (58) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	V	158	VAL
1	v	213	THR
6	I	105	ILE
6	I	188	VAL
1	B	158	VAL
1	A	158	VAL
1	C	158	VAL
1	D	158	VAL
3	F	127	LYS
6	P	105	ILE
6	P	130	ILE
1	Q	158	VAL
1	S	158	VAL
1	U	158	VAL

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	W	65	ALA
1	X	158	VAL
3	Z	129	ASP
6	h	105	ILE
6	h	188	VAL
1	i	158	VAL
1	k	158	VAL
1	n	158	VAL
1	o	65	ALA
3	J	525	ASP
1	v	211	GLY
1	C	212	MET
6	P	188	VAL
1	S	64	ASP
1	U	63	GLU
1	U	212	MET
3	J	101	THR
3	J	326	ASN
6	I	130	ILE
1	b	65	ALA
1	A	64	ASP
3	F	101	THR
3	F	326	ASN
3	Z	101	THR
3	Z	326	ASN
1	k	64	ASP
1	v	212	MET
1	A	161	ALA
1	c	65	ALA
6	h	106	VAL
3	J	159	THR
3	J	325	CYS
2	E	42	LYS
3	F	159	THR
6	P	106	VAL
1	S	161	ALA
1	k	161	ALA
6	I	106	VAL
3	J	613	VAL
6	P	138	ILE
3	Z	613	VAL
6	h	130	ILE

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Mol	Chain	Res	Type
3	F	613	VAL
3	F	616	VAL

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

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	194/196 (99%)	177 (91%)	17 (9%)	10	33
1	B	194/196 (99%)	168 (87%)	26 (13%)	4	15
1	C	194/196 (99%)	170 (88%)	24 (12%)	4	18
1	D	193/196 (98%)	178 (92%)	15 (8%)	12	38
1	G	193/196 (98%)	177 (92%)	16 (8%)	11	35
1	Q	194/196 (99%)	169 (87%)	25 (13%)	4	16
1	R	194/196 (99%)	170 (88%)	24 (12%)	4	18
1	S	194/196 (99%)	169 (87%)	25 (13%)	4	16
1	T	194/196 (99%)	177 (91%)	17 (9%)	10	33
1	U	194/196 (99%)	167 (86%)	27 (14%)	3	14
1	V	193/196 (98%)	179 (93%)	14 (7%)	14	41
1	W	194/196 (99%)	175 (90%)	19 (10%)	8	27
1	X	193/196 (98%)	172 (89%)	21 (11%)	6	23
1	a	194/196 (99%)	173 (89%)	21 (11%)	6	23
1	b	194/196 (99%)	174 (90%)	20 (10%)	7	25
1	c	194/196 (99%)	174 (90%)	20 (10%)	7	25
1	d	193/196 (98%)	175 (91%)	18 (9%)	9	30
1	i	194/196 (99%)	167 (86%)	27 (14%)	3	14
1	j	194/196 (99%)	171 (88%)	23 (12%)	5	20
1	k	194/196 (99%)	172 (89%)	22 (11%)	6	21
1	l	194/196 (99%)	176 (91%)	18 (9%)	9	30
1	n	194/196 (99%)	165 (85%)	29 (15%)	3	12

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	o	194/196 (99%)	175 (90%)	19 (10%)	8	27
1	v	193/196 (98%)	176 (91%)	17 (9%)	10	33
2	E	96/96 (100%)	82 (85%)	14 (15%)	3	13
2	K	96/96 (100%)	86 (90%)	10 (10%)	7	24
2	M	96/96 (100%)	80 (83%)	16 (17%)	2	9
2	Y	96/96 (100%)	80 (83%)	16 (17%)	2	9
2	e	96/96 (100%)	83 (86%)	13 (14%)	4	15
2	m	96/96 (100%)	87 (91%)	9 (9%)	8	29
3	F	734/958 (77%)	653 (89%)	81 (11%)	6	22
3	J	734/958 (77%)	656 (89%)	78 (11%)	6	24
3	Z	734/958 (77%)	665 (91%)	69 (9%)	8	29
4	L	198/198 (100%)	184 (93%)	14 (7%)	14	43
4	N	198/198 (100%)	188 (95%)	10 (5%)	24	56
4	f	198/198 (100%)	184 (93%)	14 (7%)	14	43
5	H	24/648 (4%)	23 (96%)	1 (4%)	30	63
5	O	24/648 (4%)	22 (92%)	2 (8%)	11	35
5	g	24/648 (4%)	22 (92%)	2 (8%)	11	35
6	I	86/162 (53%)	70 (81%)	16 (19%)	1	7
6	P	86/162 (53%)	74 (86%)	12 (14%)	3	14
6	h	86/162 (53%)	72 (84%)	14 (16%)	2	9
All	All	8352/11178 (75%)	7457 (89%)	895 (11%)	10	23

All (895) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	V	31	LEU
1	V	37	SER
1	V	38	ARG
1	V	61	ASP
1	V	83	THR
1	V	90	GLU
1	V	117	VAL
1	V	119	VAL
1	V	132	THR
1	V	150	SER

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	V	156	SER
1	V	174	VAL
1	V	185	PHE
1	V	229	VAL
2	M	1	MET
2	M	12	MET
2	M	24	ARG
2	M	38	ASN
2	M	43	THR
2	M	46	VAL
2	M	50	VAL
2	M	52	ARG
2	M	54	GLU
2	M	69	LYS
2	M	88	LYS
2	M	90	SER
2	M	91	SER
2	M	95	MET
2	M	108	VAL
2	M	109	ASN
3	J	1	MET
3	J	10	THR
3	J	15	LYS
3	J	26	VAL
3	J	38	PRO
3	J	40	ASP
3	J	50	THR
3	J	59	THR
3	J	90	LEU
3	J	97	ASP
3	J	102	ARG
3	J	122	VAL
3	J	126	SER
3	J	130	ARG
3	J	138	LEU
3	J	153	ILE
3	J	168	VAL
3	J	169	MET
3	J	177	PHE
3	J	181	MET
3	J	182	ARG
3	J	187	ASP

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
3	J	190	THR
3	J	197	THR
3	J	209	LYS
3	J	221	GLN
3	J	223	ASP
3	J	233	SER
3	J	234	ARG
3	J	235	ASN
3	J	257	SER
3	J	261	ASP
3	J	279	MET
3	J	325	CYS
3	J	347	ARG
3	J	367	LYS
3	J	372	ASN
3	J	375	ASN
3	J	380	ASP
3	J	397	ASN
3	J	426	TYR
3	J	434	ASP
3	J	456	LEU
3	J	460	GLN
3	J	461	THR
3	J	463	ASP
3	J	465	SER
3	J	469	GLU
3	J	502	THR
3	J	503	ARG
3	J	507	LEU
3	J	529	ASN
3	J	536	GLN
3	J	539	THR
3	J	540	ASP
3	J	543	LYS
3	J	555	GLU
3	J	565	THR
3	J	574	VAL
3	J	596	GLU
3	J	617	THR
3	J	621	VAL
3	J	631	ASP
3	J	648	LYS

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
3	J	650	VAL
3	J	651	SER
3	J	654	LEU
3	J	685	LEU
3	J	732	THR
3	J	735	LEU
3	J	751	LYS
3	J	757	ARG
3	J	770	LEU
3	J	778	ASN
3	J	780	LYS
3	J	809	ASP
3	J	826	HIS
3	J	834	LYS
1	v	8	MET
1	v	41	LYS
1	v	44	ASP
1	v	68	THR
1	v	81	SER
1	v	90	GLU
1	v	91	GLN
1	v	93	GLN
1	v	102	GLU
1	v	125	SER
1	v	132	THR
1	v	157	THR
1	v	167	THR
1	v	185	PHE
1	v	190	VAL
1	v	196	ARG
1	v	210	SER
2	m	13	ASP
2	m	24	ARG
2	m	30	SER
2	m	49	SER
2	m	58	LEU
2	m	59	GLU
2	m	74	THR
2	m	98	VAL
2	m	106	GLN
4	L	80	THR
4	L	97	SER

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
4	L	105	ARG
4	L	111	ARG
4	L	124	TYR
4	L	136	ARG
4	L	141	SER
4	L	147	SER
4	L	157	GLU
4	L	159	ASP
4	L	185	SER
4	L	201	THR
4	L	212	CYS
4	L	228	ASN
5	H	817	GLN
6	I	102	VAL
6	I	117	PHE
6	I	135	MET
6	I	145	SER
6	I	148	LEU
6	I	160	ARG
6	I	161	THR
6	I	163	ARG
6	I	167	THR
6	I	169	ASN
6	I	175	TYR
6	I	177	SER
6	I	204	SER
6	I	207	ILE
6	I	208	SER
6	I	209	THR
1	B	10	VAL
1	B	11	LYS
1	B	41	LYS
1	B	43	LYS
1	B	50	LEU
1	B	76	SER
1	B	79	ASP
1	B	80	THR
1	B	84	LEU
1	B	91	GLN
1	B	116	THR
1	B	127	ILE
1	B	132	THR

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	B	146	VAL
1	B	148	ARG
1	B	164	MET
1	B	185	PHE
1	B	191	THR
1	B	193	LYS
1	B	195	PHE
1	B	196	ARG
1	B	198	VAL
1	B	202	LYS
1	B	217	ASN
1	B	230	SER
1	B	232	ASN
1	b	21	LYS
1	b	38	ARG
1	b	51	THR
1	b	64	ASP
1	b	66	ASP
1	b	79	ASP
1	b	83	THR
1	b	101	ASN
1	b	102	GLU
1	b	106	ARG
1	b	117	VAL
1	b	132	THR
1	b	146	VAL
1	b	155	ARG
1	b	159	THR
1	b	177	GLN
1	b	192	ASP
1	b	217	ASN
1	b	223	LYS
1	b	230	SER
1	A	10	VAL
1	A	37	SER
1	A	57	ASP
1	A	61	ASP
1	A	66	ASP
1	A	70	THR
1	A	84	LEU
1	A	87	MET
1	A	90	GLU

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	A	104	ASP
1	A	116	THR
1	A	119	VAL
1	A	126	SER
1	A	164	MET
1	A	185	PHE
1	A	191	THR
1	A	198	VAL
1	a	29	ASN
1	a	37	SER
1	a	38	ARG
1	a	51	THR
1	a	54	SER
1	a	79	ASP
1	a	83	THR
1	a	101	ASN
1	a	132	THR
1	a	135	GLU
1	a	136	VAL
1	a	146	VAL
1	a	150	SER
1	a	180	THR
1	a	182	THR
1	a	185	PHE
1	a	186	GLN
1	a	191	THR
1	a	202	LYS
1	a	212	MET
1	a	219	VAL
1	C	8	MET
1	C	20	TYR
1	C	23	SER
1	C	33	ASP
1	C	41	LYS
1	C	45	LEU
1	C	46	THR
1	C	54	SER
1	C	64	ASP
1	C	83	THR
1	C	87	MET
1	C	96	LEU
1	C	119	VAL

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	C	131	VAL
1	C	134	LYS
1	C	141	VAL
1	C	148	ARG
1	C	156	SER
1	C	164	MET
1	C	165	THR
1	C	174	VAL
1	C	185	PHE
1	C	191	THR
1	C	213	THR
1	c	8	MET
1	c	33	ASP
1	c	35	ASP
1	c	37	SER
1	c	39	LEU
1	c	43	LYS
1	c	63	GLU
1	c	66	ASP
1	c	74	GLN
1	c	83	THR
1	c	84	LEU
1	c	90	GLU
1	c	132	THR
1	c	139	ARG
1	c	146	VAL
1	c	155	ARG
1	c	165	THR
1	c	167	THR
1	c	196	ARG
1	c	209	VAL
1	D	31	LEU
1	D	37	SER
1	D	38	ARG
1	D	51	THR
1	D	56	ASP
1	D	61	ASP
1	D	79	ASP
1	D	83	THR
1	D	117	VAL
1	D	119	VAL
1	D	150	SER

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	D	174	VAL
1	D	185	PHE
1	D	191	THR
1	D	229	VAL
2	E	5	ARG
2	E	38	ASN
2	E	46	VAL
2	E	47	THR
2	E	50	VAL
2	E	52	ARG
2	E	53	GLU
2	E	54	GLU
2	E	84	VAL
2	E	90	SER
2	E	91	SER
2	E	95	MET
2	E	108	VAL
2	E	109	ASN
3	F	1	MET
3	F	10	THR
3	F	15	LYS
3	F	26	VAL
3	F	40	ASP
3	F	42	LEU
3	F	49	SER
3	F	50	THR
3	F	97	ASP
3	F	110	ASP
3	F	122	VAL
3	F	127	LYS
3	F	138	LEU
3	F	153	ILE
3	F	158	LYS
3	F	168	VAL
3	F	169	MET
3	F	177	PHE
3	F	187	ASP
3	F	190	THR
3	F	197	THR
3	F	217	LEU
3	F	223	ASP
3	F	226	GLN

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
3	F	233	SER
3	F	234	ARG
3	F	235	ASN
3	F	237	HIS
3	F	245	VAL
3	F	257	SER
3	F	261	ASP
3	F	279	MET
3	F	281	THR
3	F	324	THR
3	F	325	CYS
3	F	373	ARG
3	F	378	MET
3	F	380	ASP
3	F	381	ASP
3	F	397	ASN
3	F	411	GLU
3	F	412	THR
3	F	426	TYR
3	F	460	GLN
3	F	461	THR
3	F	463	ASP
3	F	465	SER
3	F	472	ARG
3	F	502	THR
3	F	503	ARG
3	F	518	THR
3	F	527	SER
3	F	529	ASN
3	F	531	VAL
3	F	536	GLN
3	F	539	THR
3	F	562	LYS
3	F	565	THR
3	F	596	GLU
3	F	617	THR
3	F	621	VAL
3	F	631	ASP
3	F	640	ARG
3	F	651	SER
3	F	653	LEU
3	F	654	LEU

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
3	F	675	GLU
3	F	676	THR
3	F	719	ARG
3	F	732	THR
3	F	735	LEU
3	F	751	LYS
3	F	757	ARG
3	F	770	LEU
3	F	778	ASN
3	F	780	LYS
3	F	809	ASP
3	F	818	PHE
3	F	821	LYS
3	F	826	HIS
3	F	834	LYS
1	G	11	LYS
1	G	41	LYS
1	G	44	ASP
1	G	54	SER
1	G	68	THR
1	G	83	THR
1	G	84	LEU
1	G	90	GLU
1	G	102	GLU
1	G	125	SER
1	G	132	THR
1	G	157	THR
1	G	167	THR
1	G	190	VAL
1	G	212	MET
1	G	213	THR
2	K	13	ASP
2	K	16	SER
2	K	22	LYS
2	K	30	SER
2	K	49	SER
2	K	58	LEU
2	K	74	THR
2	K	98	VAL
2	K	99	GLU
2	K	101	SER
4	N	1	MET

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
4	N	73	THR
4	N	111	ARG
4	N	124	TYR
4	N	142	GLU
4	N	159	ASP
4	N	167	ILE
4	N	185	SER
4	N	201	THR
4	N	212	CYS
5	O	824	LYS
5	O	835	ARG
6	P	102	VAL
6	P	105	ILE
6	P	117	PHE
6	P	135	MET
6	P	148	LEU
6	P	161	THR
6	P	163	ARG
6	P	167	THR
6	P	175	TYR
6	P	204	SER
6	P	208	SER
6	P	217	GLN
1	Q	10	VAL
1	Q	29	ASN
1	Q	37	SER
1	Q	38	ARG
1	Q	41	LYS
1	Q	43	LYS
1	Q	46	THR
1	Q	76	SER
1	Q	80	THR
1	Q	84	LEU
1	Q	87	MET
1	Q	90	GLU
1	Q	91	GLN
1	Q	116	THR
1	Q	132	THR
1	Q	146	VAL
1	Q	185	PHE
1	Q	191	THR
1	Q	193	LYS

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	Q	195	PHE
1	Q	196	ARG
1	Q	198	VAL
1	Q	210	SER
1	Q	230	SER
1	Q	232	ASN
1	R	41	LYS
1	R	49	GLU
1	R	64	ASP
1	R	66	ASP
1	R	79	ASP
1	R	83	THR
1	R	84	LEU
1	R	91	GLN
1	R	101	ASN
1	R	102	GLU
1	R	104	ASP
1	R	106	ARG
1	R	132	THR
1	R	150	SER
1	R	155	ARG
1	R	159	THR
1	R	177	GLN
1	R	185	PHE
1	R	192	ASP
1	R	196	ARG
1	R	217	ASN
1	R	223	LYS
1	R	230	SER
1	R	244	THR
1	S	10	VAL
1	S	37	SER
1	S	38	ARG
1	S	57	ASP
1	S	64	ASP
1	S	66	ASP
1	S	70	THR
1	S	84	LEU
1	S	90	GLU
1	S	91	GLN
1	S	104	ASP
1	S	116	THR

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	S	119	VAL
1	S	126	SER
1	S	132	THR
1	S	135	GLU
1	S	141	VAL
1	S	146	VAL
1	S	164	MET
1	S	185	PHE
1	S	191	THR
1	S	198	VAL
1	S	212	MET
1	S	232	ASN
1	S	242	THR
1	T	15	THR
1	T	29	ASN
1	T	38	ARG
1	T	54	SER
1	T	64	ASP
1	T	79	ASP
1	T	83	THR
1	T	87	MET
1	T	102	GLU
1	T	106	ARG
1	T	132	THR
1	T	136	VAL
1	T	146	VAL
1	T	164	MET
1	T	177	GLN
1	T	191	THR
1	T	202	LYS
1	U	8	MET
1	U	11	LYS
1	U	20	TYR
1	U	23	SER
1	U	33	ASP
1	U	35	ASP
1	U	38	ARG
1	U	41	LYS
1	U	54	SER
1	U	63	GLU
1	U	83	THR
1	U	84	LEU

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	U	87	MET
1	U	96	LEU
1	U	111	ARG
1	U	119	VAL
1	U	131	VAL
1	U	141	VAL
1	U	145	ASN
1	U	148	ARG
1	U	156	SER
1	U	164	MET
1	U	165	THR
1	U	174	VAL
1	U	185	PHE
1	U	191	THR
1	U	213	THR
1	W	8	MET
1	W	33	ASP
1	W	37	SER
1	W	39	LEU
1	W	43	LYS
1	W	64	ASP
1	W	66	ASP
1	W	87	MET
1	W	90	GLU
1	W	132	THR
1	W	139	ARG
1	W	146	VAL
1	W	155	ARG
1	W	165	THR
1	W	167	THR
1	W	195	PHE
1	W	196	ARG
1	W	209	VAL
1	W	225	ASN
1	X	31	LEU
1	X	32	SER
1	X	37	SER
1	X	38	ARG
1	X	51	THR
1	X	56	ASP
1	X	61	ASP
1	X	66	ASP

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	X	79	ASP
1	X	83	THR
1	X	90	GLU
1	X	117	VAL
1	X	119	VAL
1	X	136	VAL
1	X	150	SER
1	X	156	SER
1	X	164	MET
1	X	174	VAL
1	X	185	PHE
1	X	196	ARG
1	X	229	VAL
2	Y	9	LYS
2	Y	12	MET
2	Y	38	ASN
2	Y	43	THR
2	Y	46	VAL
2	Y	47	THR
2	Y	50	VAL
2	Y	52	ARG
2	Y	53	GLU
2	Y	54	GLU
2	Y	84	VAL
2	Y	88	LYS
2	Y	90	SER
2	Y	91	SER
2	Y	108	VAL
2	Y	109	ASN
3	Z	10	THR
3	Z	15	LYS
3	Z	26	VAL
3	Z	38	PRO
3	Z	40	ASP
3	Z	42	LEU
3	Z	50	THR
3	Z	59	THR
3	Z	90	LEU
3	Z	102	ARG
3	Z	115	THR
3	Z	126	SER
3	Z	138	LEU

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
3	Z	152	ASP
3	Z	153	ILE
3	Z	158	LYS
3	Z	168	VAL
3	Z	169	MET
3	Z	177	PHE
3	Z	187	ASP
3	Z	190	THR
3	Z	197	THR
3	Z	209	LYS
3	Z	215	THR
3	Z	221	GLN
3	Z	223	ASP
3	Z	233	SER
3	Z	234	ARG
3	Z	235	ASN
3	Z	237	HIS
3	Z	257	SER
3	Z	261	ASP
3	Z	325	CYS
3	Z	341	ASP
3	Z	357	LEU
3	Z	367	LYS
3	Z	375	ASN
3	Z	381	ASP
3	Z	397	ASN
3	Z	426	TYR
3	Z	469	GLU
3	Z	472	ARG
3	Z	502	THR
3	Z	503	ARG
3	Z	507	LEU
3	Z	529	ASN
3	Z	536	GLN
3	Z	539	THR
3	Z	562	LYS
3	Z	596	GLU
3	Z	617	THR
3	Z	621	VAL
3	Z	631	ASP
3	Z	646	VAL
3	Z	648	LYS

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
3	Z	651	SER
3	Z	654	LEU
3	Z	719	ARG
3	Z	732	THR
3	Z	738	TYR
3	Z	740	PRO
3	Z	751	LYS
3	Z	757	ARG
3	Z	770	LEU
3	Z	778	ASN
3	Z	809	ASP
3	Z	821	LYS
3	Z	826	HIS
3	Z	834	LYS
1	d	11	LYS
1	d	44	ASP
1	d	51	THR
1	d	63	GLU
1	d	68	THR
1	d	70	THR
1	d	81	SER
1	d	84	LEU
1	d	90	GLU
1	d	91	GLN
1	d	125	SER
1	d	132	THR
1	d	157	THR
1	d	167	THR
1	d	190	VAL
1	d	196	ARG
1	d	212	MET
1	d	223	LYS
2	e	1	MET
2	e	13	ASP
2	e	22	LYS
2	e	29	TYR
2	e	30	SER
2	e	47	THR
2	e	53	GLU
2	e	58	LEU
2	e	60	SER
2	e	74	THR

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
2	e	85	THR
2	e	92	ARG
2	e	98	VAL
4	f	1	MET
4	f	78	THR
4	f	80	THR
4	f	87	MET
4	f	111	ARG
4	f	124	TYR
4	f	141	SER
4	f	142	GLU
4	f	154	THR
4	f	159	ASP
4	f	166	ARG
4	f	185	SER
4	f	201	THR
4	f	212	CYS
5	g	831	ARG
5	g	835	ARG
6	h	102	VAL
6	h	105	ILE
6	h	135	MET
6	h	145	SER
6	h	148	LEU
6	h	160	ARG
6	h	161	THR
6	h	163	ARG
6	h	167	THR
6	h	171	LYS
6	h	175	TYR
6	h	177	SER
6	h	204	SER
6	h	217	GLN
1	i	8	MET
1	i	10	VAL
1	i	15	THR
1	i	16	THR
1	i	29	ASN
1	i	35	ASP
1	i	41	LYS
1	i	43	LYS
1	i	63	GLU

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	i	70	THR
1	i	76	SER
1	i	79	ASP
1	i	80	THR
1	i	87	MET
1	i	91	GLN
1	i	116	THR
1	i	127	ILE
1	i	146	VAL
1	i	185	PHE
1	i	191	THR
1	i	193	LYS
1	i	195	PHE
1	i	196	ARG
1	i	198	VAL
1	i	217	ASN
1	i	230	SER
1	i	232	ASN
1	j	3	VAL
1	j	17	LEU
1	j	51	THR
1	j	66	ASP
1	j	79	ASP
1	j	83	THR
1	j	84	LEU
1	j	101	ASN
1	j	102	GLU
1	j	104	ASP
1	j	106	ARG
1	j	117	VAL
1	j	132	THR
1	j	150	SER
1	j	155	ARG
1	j	159	THR
1	j	185	PHE
1	j	192	ASP
1	j	196	ARG
1	j	213	THR
1	j	217	ASN
1	j	223	LYS
1	j	230	SER
1	k	10	VAL

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	k	37	SER
1	k	38	ARG
1	k	51	THR
1	k	57	ASP
1	k	61	ASP
1	k	66	ASP
1	k	70	THR
1	k	76	SER
1	k	84	LEU
1	k	90	GLU
1	k	116	THR
1	k	119	VAL
1	k	132	THR
1	k	135	GLU
1	k	146	VAL
1	k	164	MET
1	k	185	PHE
1	k	191	THR
1	k	198	VAL
1	k	212	MET
1	k	242	THR
1	l	29	ASN
1	l	54	SER
1	l	79	ASP
1	l	83	THR
1	l	101	ASN
1	l	132	THR
1	l	136	VAL
1	l	139	ARG
1	l	146	VAL
1	l	150	SER
1	l	164	MET
1	l	177	GLN
1	l	185	PHE
1	l	186	GLN
1	l	190	VAL
1	l	191	THR
1	l	202	LYS
1	l	219	VAL
1	n	8	MET
1	n	20	TYR
1	n	23	SER

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	n	33	ASP
1	n	41	LYS
1	n	45	LEU
1	n	46	THR
1	n	54	SER
1	n	62	ASP
1	n	64	ASP
1	n	70	THR
1	n	75	LYS
1	n	83	THR
1	n	87	MET
1	n	111	ARG
1	n	119	VAL
1	n	121	ARG
1	n	131	VAL
1	n	141	VAL
1	n	148	ARG
1	n	156	SER
1	n	164	MET
1	n	165	THR
1	n	174	VAL
1	n	185	PHE
1	n	191	THR
1	n	198	VAL
1	n	212	MET
1	n	213	THR
1	o	8	MET
1	o	33	ASP
1	o	37	SER
1	o	43	LYS
1	o	63	GLU
1	o	66	ASP
1	o	83	THR
1	o	84	LEU
1	o	90	GLU
1	o	132	THR
1	o	139	ARG
1	o	146	VAL
1	o	155	ARG
1	o	165	THR
1	o	167	THR
1	o	196	ARG

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Mol	Chain	Res	Type
1	o	209	VAL
1	o	225	ASN
1	o	235	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
3	J	75	GLN
3	J	407	ASN
1	a	72	GLN
3	F	75	GLN
3	F	408	ASN
6	P	217	GLN
1	R	186	GLN
1	W	93	GLN
3	Z	75	GLN
3	Z	178	ASN
1	j	186	GLN
1	l	72	GLN
1	l	225	ASN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 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](#)

3 ligands 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
7	SF4	N	301	4	0,12,12	-	-	-		
7	SF4	L	301	4	0,12,12	-	-	-		
7	SF4	f	301	4	0,12,12	-	-	-		

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
7	SF4	N	301	4	-	-	0/6/5/5
7	SF4	L	301	4	-	-	0/6/5/5
7	SF4	f	301	4	-	-	0/6/5/5

There are no bond length outliers.

There are no bond angle outliers.

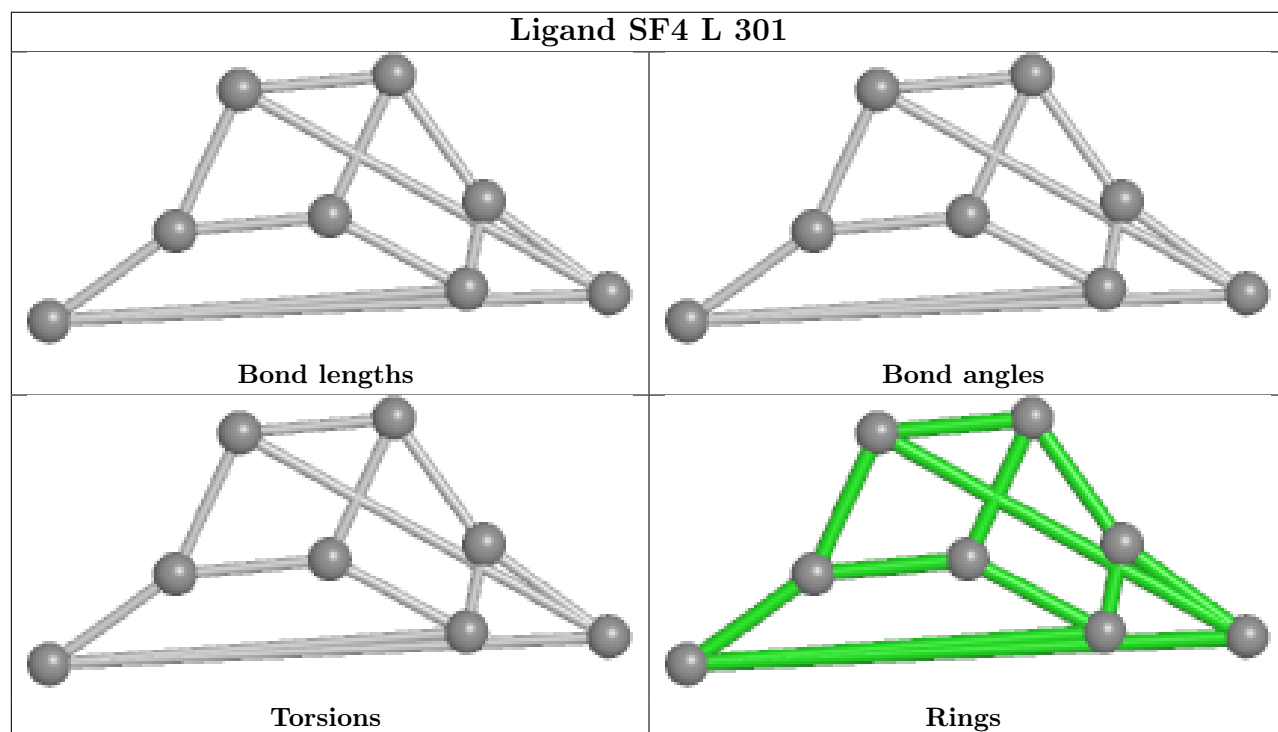
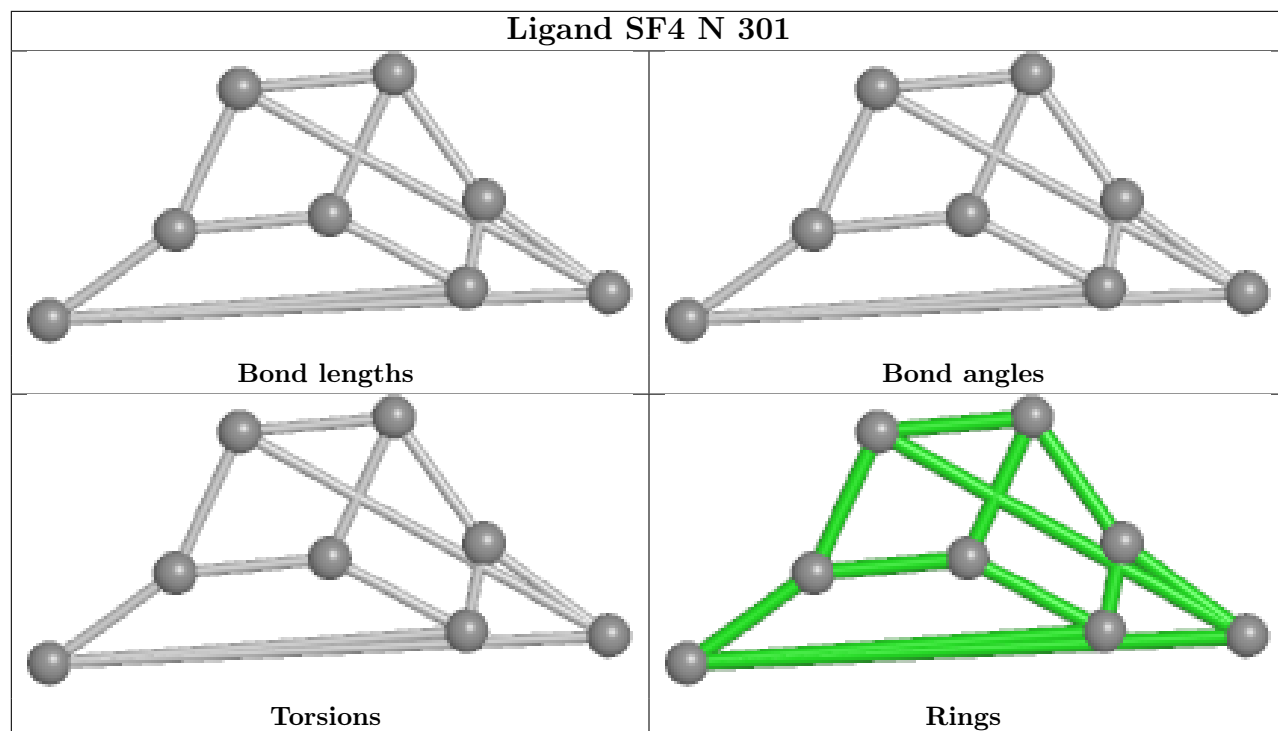
There are no chirality outliers.

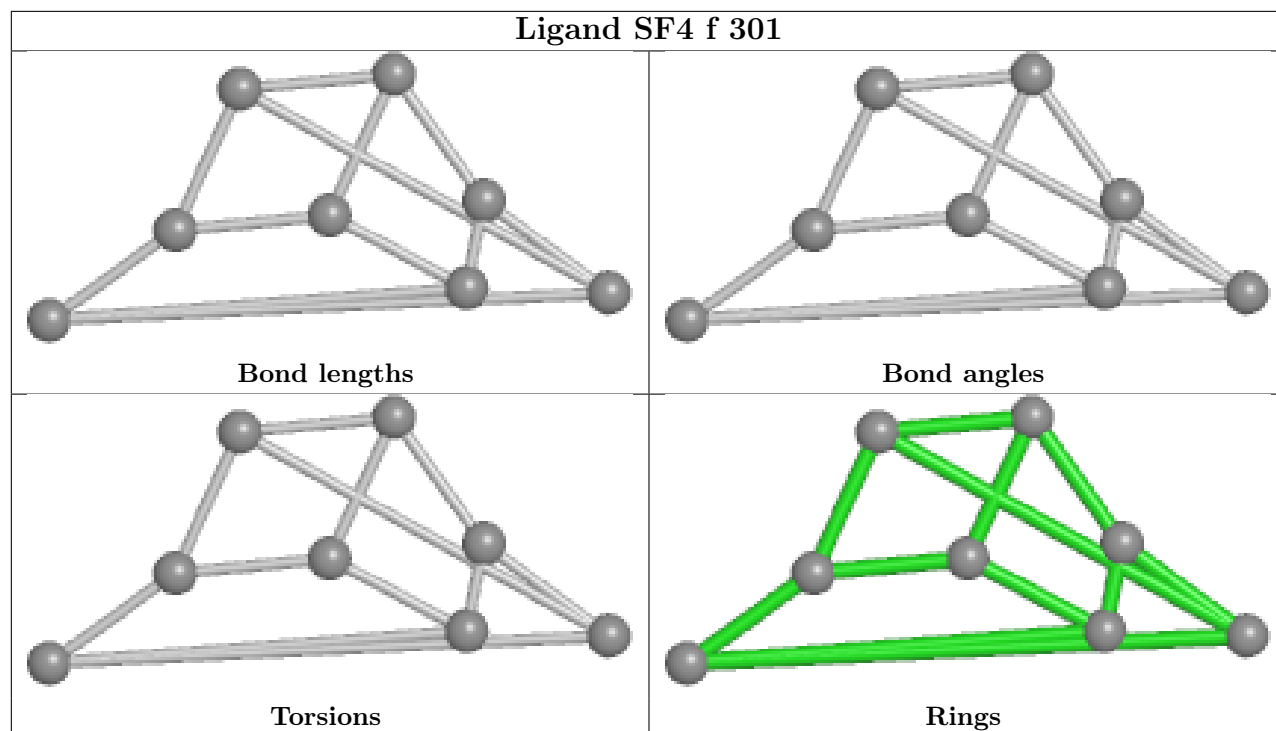
There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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.