



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 10:10 AM UTC

PDB ID : 4Y8J / pdb_00004y8j
Title : Yeast 20S proteasome in complex with Ac-LLL-ep
Authors : Huber, E.M.; Groll, M.
Deposited on : 2015-02-16
Resolution : 2.70 Å(reported)

This is a Full wwPDB X-ray Structure 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/XrayValidationReportHelp>

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:

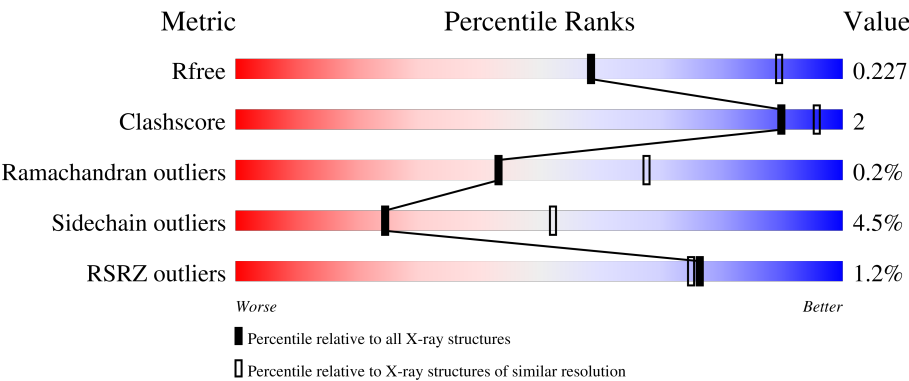
MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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)	Similar resolution (#Entries, resolution range(Å))
R _{free}	180053	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower 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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	250	0% 95%5%
1	O	250	2% 93%7%
2	B	258	3% 86%7%5%
2	P	258	3% 86%8%5%
3	C	254	3% 86%6%6%

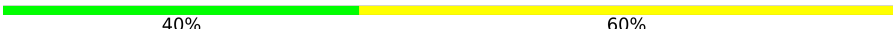
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Mol	Chain	Length	Quality of chain
3	Q	254	 4% 87% 6% • 6%
4	D	260	 2% 82% 8% • 10%
4	R	260	 2% 81% 9% • 10%
5	E	234	 88% 10% ••
5	S	234	 2% 87% 11% ••
6	F	288	 2% 81% • 16%
6	T	288	 2% 80% • 16%
7	G	252	 2% 89% 6% •
7	U	252	 2% 88% 8% •
8	H	232	 90% 6% •
8	V	232	 2% 90% 5% •
9	I	205	 92% 7%
9	W	205	 93% 6% •
10	J	198	 2% 90% 7% ••
10	X	198	 2% 89% 8% ••
11	K	212	 92% 8%
11	Y	212	 92% 8%
12	L	222	 94% 5% •
12	Z	222	 93% 6% •
13	M	246	 2% 87% 6% 7%
13	a	246	 2% 89% 6% 5%
14	N	196	 93% 7%
14	b	196	 2% 92% 7% •
15	c	5	 80% 20%
15	d	5	 60% 40%

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Mol	Chain	Length	Quality of chain
15	e	5	 60% 40%
15	f	5	 80% 20%
15	g	5	 80% 20%
15	h	5	 40% 60%

2 Entry composition

There are 19 unique types of molecules in this entry. The entry contains 49942 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, 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 Proteasome subunit alpha type-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	250	Total	C	N	O	S	0	0	0
			1915	1219	315	377	4			
1	O	250	Total	C	N	O	S	0	0	0
			1915	1219	315	377	4			

- Molecule 2 is a protein called Proteasome subunit alpha type-3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	244	Total	C	N	O	S	0	0	0
			1904	1201	321	379	3			
2	P	244	Total	C	N	O	S	0	0	0
			1904	1201	321	379	3			

- Molecule 3 is a protein called Proteasome subunit alpha type-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	240	Total	C	N	O	S	0	0	0
			1881	1176	329	372	4			
3	Q	240	Total	C	N	O	S	0	0	0
			1881	1176	329	372	4			

- Molecule 4 is a protein called Proteasome subunit alpha type-5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	235	Total	C	N	O	S	0	0	0
			1813	1136	304	366	7			
4	R	235	Total	C	N	O	S	0	0	0
			1813	1136	304	366	7			

- Molecule 5 is a protein called Proteasome subunit alpha type-6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	E	231	Total	C	N	O	S	0	0	0
			1773	1114	307	348	4			
5	S	231	Total	C	N	O	S	0	0	0
			1773	1114	307	348	4			

- Molecule 6 is a protein called Probable proteasome subunit alpha type-7.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
6	F	243	Total	C	N	O	S	0	0	0
			1892	1203	329	356	4			
6	T	243	Total	C	N	O	S	0	0	0
			1892	1203	329	356	4			

- Molecule 7 is a protein called Proteasome subunit alpha type-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
7	G	241	Total	C	N	O	S	0	0	0
			1907	1214	320	365	8			
7	U	241	Total	C	N	O	S	0	0	0
			1907	1214	320	365	8			

- Molecule 8 is a protein called Proteasome subunit beta type-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
8	H	222	Total	C	N	O	S	0	0	0
			1684	1061	293	323	7			
8	V	222	Total	C	N	O	S	0	0	0
			1684	1061	293	323	7			

- Molecule 9 is a protein called Proteasome subunit beta type-3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
9	I	204	Total	C	N	O	S	0	0	0
			1581	1010	258	305	8			
9	W	204	Total	C	N	O	S	0	0	0
			1581	1010	258	305	8			

- Molecule 10 is a protein called Proteasome subunit beta type-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
10	J	195	Total	C	N	O	S	0	0	0
			1561	992	264	299	6			

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
10	X	195	Total	C	N	O	S	0	0	0
			1561	992	264	299	6			

- Molecule 11 is a protein called Proteasome subunit beta type-5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
11	K	212	Total	C	N	O	S	0	0	0
			1644	1045	280	312	7			
11	Y	212	Total	C	N	O	S	0	0	0
			1644	1045	280	312	7			

- Molecule 12 is a protein called Proteasome subunit beta type-6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
12	L	222	Total	C	N	O	S	0	0	0
			1757	1115	303	335	4			
12	Z	222	Total	C	N	O	S	0	0	0
			1757	1115	303	335	4			

- Molecule 13 is a protein called Proteasome subunit beta type-7.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
13	M	230	Total	C	N	O	S	0	0	0
			1797	1137	307	346	7			
13	a	233	Total	C	N	O	S	0	0	0
			1824	1154	312	351	7			

- Molecule 14 is a protein called Proteasome subunit beta type-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
14	N	196	Total	C	N	O	S	0	0	0
			1512	955	250	300	7			
14	b	196	Total	C	N	O	S	0	0	0
			1512	955	250	300	7			

- Molecule 15 is a protein called Ac-PLL-ep.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
15	c	5	Total	C	N	O	0	0	0
			31	23	3	5			
15	d	5	Total	C	N	O	0	0	0
			31	23	3	5			

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
15	e	5	Total	C	N	O	0	0	0
			31	23	3	5			
15	f	5	Total	C	N	O	0	0	0
			31	23	3	5			
15	g	5	Total	C	N	O	0	0	0
			31	23	3	5			
15	h	5	Total	C	N	O	0	0	0
			31	23	3	5			

- Molecule 16 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
16	G	1	Total	Mg	0	0
			1	1		
16	I	2	Total	Mg	0	0
			2	2		
16	K	1	Total	Mg	0	0
			1	1		
16	L	1	Total	Mg	0	0
			1	1		
16	N	1	Total	Mg	0	0
			1	1		
16	Z	1	Total	Mg	0	0
			1	1		

- Molecule 17 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
17	G	1	Total	Cl	0	0
			1	1		
17	N	1	Total	Cl	0	0
			1	1		
17	U	1	Total	Cl	0	0
			1	1		
17	b	1	Total	Cl	0	0
			1	1		
17	e	1	Total	Cl	0	0
			1	1		

- Molecule 18 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: C₆H₁₃NO₄S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
18	H	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
18	K	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
18	V	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
18	Y	1	Total	C	N	O	S	0	0
			12	6	1	4	1		

- Molecule 19 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
19	A	12	Total	O	0	0
			12	12		
19	B	14	Total	O	0	0
			14	14		
19	C	21	Total	O	0	0
			21	21		
19	D	8	Total	O	0	0
			8	8		
19	E	9	Total	O	0	0
			9	9		
19	F	14	Total	O	0	0
			14	14		
19	G	16	Total	O	0	0
			16	16		
19	H	19	Total	O	0	0
			19	19		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
19	I	20	Total O 20 20	0	0
19	J	21	Total O 21 21	0	0
19	K	17	Total O 17 17	0	0
19	L	21	Total O 21 21	0	0
19	M	16	Total O 16 16	0	0
19	N	8	Total O 8 8	0	0
19	O	17	Total O 17 17	0	0
19	P	11	Total O 11 11	0	0
19	Q	7	Total O 7 7	0	0
19	R	12	Total O 12 12	0	0
19	S	6	Total O 6 6	0	0
19	T	17	Total O 17 17	0	0
19	U	16	Total O 16 16	0	0
19	V	16	Total O 16 16	0	0
19	W	14	Total O 14 14	0	0
19	X	16	Total O 16 16	0	0
19	Y	19	Total O 19 19	0	0
19	Z	22	Total O 22 22	0	0
19	a	19	Total O 19 19	0	0
19	b	16	Total O 16 16	0	0
19	d	1	Total O 1 1	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
19	g	1	Total	O	0	0
			1	1		
19	h	1	Total	O	0	0
			1	1		

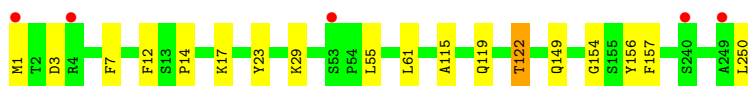
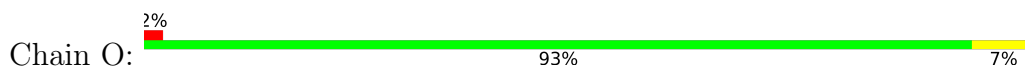
3 Residue-property plots [i](#)

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 and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). 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.

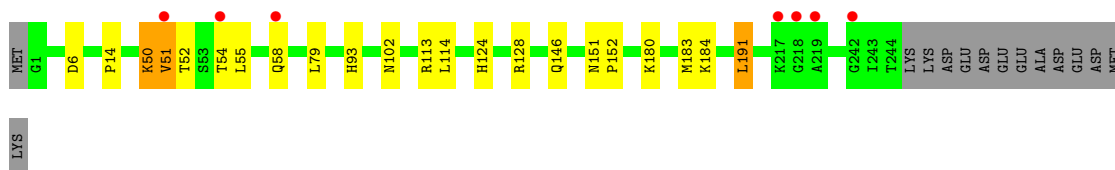
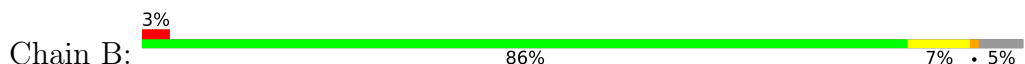
- Molecule 1: Proteasome subunit alpha type-2



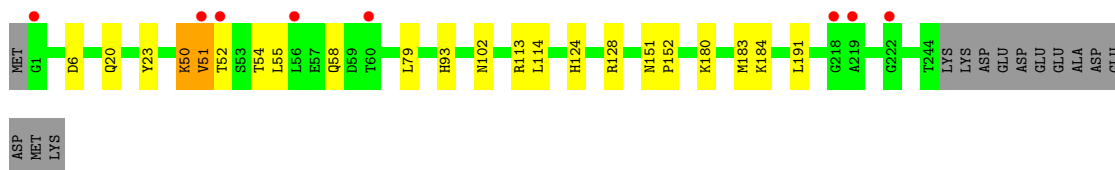
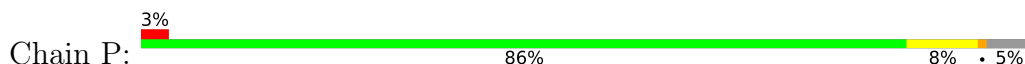
- Molecule 1: Proteasome subunit alpha type-2



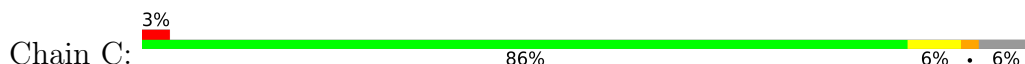
- Molecule 2: Proteasome subunit alpha type-3

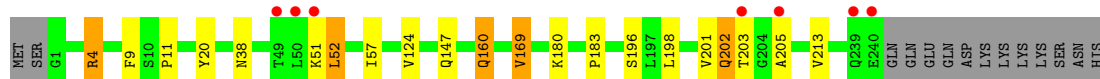


- Molecule 2: Proteasome subunit alpha type-3

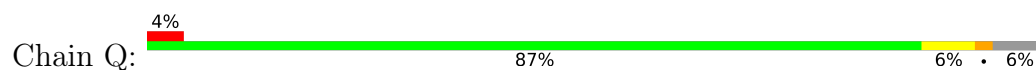


- Molecule 3: Proteasome subunit alpha type-4

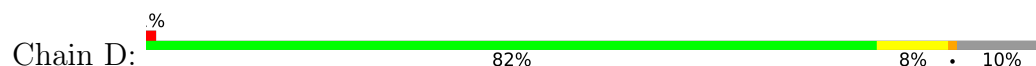




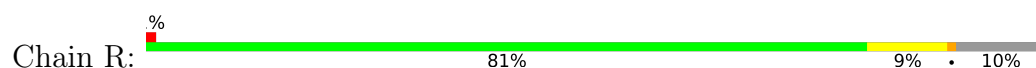
• Molecule 3: Proteasome subunit alpha type-4



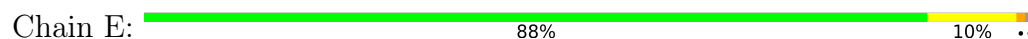
• Molecule 4: Proteasome subunit alpha type-5



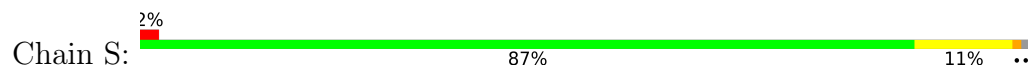
• Molecule 4: Proteasome subunit alpha type-5



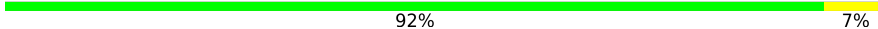
• Molecule 5: Proteasome subunit alpha type-6



• Molecule 5: Proteasome subunit alpha type-6

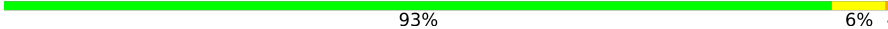


- Molecule 9: Proteasome subunit beta type-3

Chain I:  92% 7%



- Molecule 9: Proteasome subunit beta type-3

Chain W:  93% 6%



- Molecule 10: Proteasome subunit beta type-4

Chain J:  90% 7%

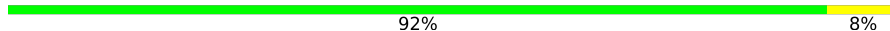


- Molecule 10: Proteasome subunit beta type-4

Chain X:  89% 8%



- Molecule 11: Proteasome subunit beta type-5

Chain K:  92% 8%



- Molecule 11: Proteasome subunit beta type-5

Chain Y:  92% 8%

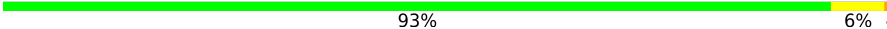


- Molecule 12: Proteasome subunit beta type-6

Chain L:  94% 5%



- Molecule 12: Proteasome subunit beta type-6

Chain Z:  93% 6%



- Molecule 13: Proteasome subunit beta type-7

Chain M:  87% 6% 7%



- Molecule 13: Proteasome subunit beta type-7

Chain a:  89% 6% 5%

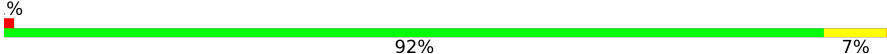


- Molecule 14: Proteasome subunit beta type-1

Chain N:  93% 7%



- Molecule 14: Proteasome subunit beta type-1

Chain b:  92% 7%



- Molecule 15: Ac-PLL-ep

Chain c:  80% 20%



- Molecule 15: Ac-PLL-ep

Chain d:  60% 40%



- Molecule 15: Ac-PLL-ep

Chain e:  60% 40%



- Molecule 15: Ac-PLL-ep

Chain f:  80% 20%



- Molecule 15: Ac-PLL-ep

Chain g:  80% 20%



- Molecule 15: Ac-PLL-ep

Chain h:  40% 60%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	136.19Å 299.33Å 144.94Å 90.00° 112.97° 90.00°	Depositor
Resolution (Å)	15.00 – 2.70 15.00 – 2.70	Depositor EDS
% Data completeness (in resolution range)	97.1 (15.00-2.70) 96.6 (15.00-2.70)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.44 (at 2.69Å)	Xtriage
Refinement program	REFMAC 5.7.0032	Depositor
R, R_{free}	0.198 , 0.224 0.202 , 0.227	Depositor DCC
R_{free} test set	14069 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	56.1	Xtriage
Anisotropy	0.038	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 49.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	49942	wwPDB-VP
Average B, all atoms (Å ²)	63.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.16% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: DCL, MES, MG, ACE, POL, CL

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	0.40	0/1952	0.70	0/2642
1	O	0.40	0/1952	0.69	0/2642
2	B	0.41	0/1934	0.70	0/2618
2	P	0.40	0/1934	0.70	0/2618
3	C	0.41	0/1910	0.71	0/2586
3	Q	0.41	0/1910	0.72	0/2586
4	D	0.40	0/1837	0.67	0/2475
4	R	0.40	0/1837	0.67	0/2475
5	E	0.40	0/1800	0.67	0/2433
5	S	0.40	0/1800	0.68	0/2433
6	F	0.41	0/1932	0.71	0/2609
6	T	0.41	0/1932	0.71	0/2609
7	G	0.40	0/1945	0.68	0/2634
7	U	0.40	0/1945	0.68	0/2634
8	H	0.39	0/1715	0.68	0/2326
8	V	0.42	0/1715	0.68	0/2326
9	I	0.40	0/1611	0.70	1/2174 (0.0%)
9	W	0.40	0/1611	0.71	1/2174 (0.0%)
10	J	0.38	0/1589	0.67	0/2142
10	X	0.39	0/1589	0.67	0/2142
11	K	0.39	0/1681	0.67	0/2274
11	Y	0.39	0/1681	0.68	0/2274
12	L	0.38	0/1795	0.67	0/2420
12	Z	0.39	0/1795	0.67	0/2420
13	M	0.41	0/1828	0.68	0/2480
13	a	0.41	0/1855	0.68	0/2514
14	N	0.43	0/1541	0.72	1/2087 (0.0%)
14	b	0.46	0/1541	0.72	1/2087 (0.0%)
15	c	1.40	0/16	1.15	0/21
15	d	1.40	0/16	1.11	0/21
15	e	0.72	0/16	0.94	0/21
15	f	1.21	0/16	1.06	0/21

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
15	g	1.19	0/16	1.16	0/21
15	h	0.72	0/16	0.96	0/21
All	All	0.41	0/50263	0.69	4/67960 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	W	126	ILE	CB-CA-C	-6.07	104.14	111.85
14	N	1	THR	N-CA-C	5.11	125.31	111.00
14	b	1	THR	N-CA-C	5.11	125.31	111.00
9	I	126	ILE	CB-CA-C	-5.05	105.44	111.85

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1915	0	1929	4	0
1	O	1915	0	1929	9	0
2	B	1904	0	1904	11	0
2	P	1904	0	1904	10	0
3	C	1881	0	1895	13	0
3	Q	1881	0	1895	12	0
4	D	1813	0	1797	6	0
4	R	1813	0	1797	8	0
5	E	1773	0	1775	9	0
5	S	1773	0	1775	10	0
6	F	1892	0	1883	2	0
6	T	1892	0	1883	3	0
7	G	1907	0	1901	4	0
7	U	1907	0	1901	7	0
8	H	1684	0	1685	6	0
8	V	1684	0	1685	6	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
9	I	1581	0	1574	6	0
9	W	1581	0	1574	6	0
10	J	1561	0	1569	12	0
10	X	1561	0	1569	13	0
11	K	1644	0	1592	9	0
11	Y	1644	0	1592	10	0
12	L	1757	0	1711	4	0
12	Z	1757	0	1711	5	0
13	M	1797	0	1800	4	0
13	a	1824	0	1832	4	0
14	N	1512	0	1478	5	0
14	b	1512	0	1478	7	0
15	c	31	0	41	1	0
15	d	31	0	41	2	0
15	e	31	0	41	2	0
15	f	31	0	41	2	0
15	g	31	0	41	1	0
15	h	31	0	41	3	0
16	G	1	0	0	0	0
16	I	2	0	0	0	0
16	K	1	0	0	0	0
16	L	1	0	0	0	0
16	N	1	0	0	0	0
16	Z	1	0	0	0	0
17	G	1	0	0	1	0
17	N	1	0	0	0	0
17	U	1	0	0	0	0
17	b	1	0	0	0	0
17	e	1	0	0	0	0
18	H	12	0	13	0	0
18	K	12	0	13	0	0
18	V	12	0	13	0	0
18	Y	12	0	13	0	0
19	A	12	0	0	0	0
19	B	14	0	0	0	0
19	C	21	0	0	0	0
19	D	8	0	0	0	0
19	E	9	0	0	1	0
19	F	14	0	0	0	0
19	G	16	0	0	0	0
19	H	19	0	0	1	0
19	I	20	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
19	J	21	0	0	0	0
19	K	17	0	0	1	0
19	L	21	0	0	0	0
19	M	16	0	0	0	0
19	N	8	0	0	0	0
19	O	17	0	0	0	0
19	P	11	0	0	0	0
19	Q	7	0	0	0	0
19	R	12	0	0	0	0
19	S	6	0	0	0	0
19	T	17	0	0	0	0
19	U	16	0	0	0	0
19	V	16	0	0	0	0
19	W	14	0	0	0	0
19	X	16	0	0	0	0
19	Y	19	0	0	2	0
19	Z	22	0	0	0	0
19	a	19	0	0	0	0
19	b	16	0	0	0	0
19	d	1	0	0	0	0
19	g	1	0	0	0	0
19	h	1	0	0	0	0
All	All	49942	0	49316	175	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 2.

All (175) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
11:K:100:MET:HE3	11:K:127:PHE:HB2	1.59	0.82
11:Y:100:MET:HE3	11:Y:127:PHE:HB2	1.59	0.82
10:J:23:ARG:HD3	19:K:401:HOH:O	1.81	0.79
10:X:1:MET:O	10:X:2:ASP:HB2	1.86	0.76
10:J:1:MET:O	10:J:2:ASP:HB2	1.87	0.73
12:Z:13:LEU:HD13	12:Z:150:LEU:HD21	1.72	0.71
12:L:13:LEU:HD13	12:L:150:LEU:HD21	1.72	0.71
4:D:99:ILE:HD11	4:D:104:LEU:HB2	1.75	0.69
4:R:99:ILE:HD11	4:R:104:LEU:HB2	1.75	0.67
14:b:22:THR:HG23	15:h:2:LEU:HD23	1.78	0.66
14:b:152:VAL:HA	14:b:175:MET:HE1	1.79	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
14:N:152:VAL:HA	14:N:175:MET:HE1	1.80	0.62
8:V:49:ALA:HA	15:f:4:DCL:HD13	1.80	0.62
3:Q:51:LYS:O	3:Q:52:LEU:HB2	2.03	0.59
3:C:51:LYS:O	3:C:52:LEU:HB2	2.03	0.58
10:J:174:MET:HA	10:X:174:MET:HA	1.87	0.55
8:H:49:ALA:HA	15:c:4:DCL:HD13	1.88	0.55
7:U:23:PHE:O	7:U:26:THR:HB	2.06	0.55
2:B:124:HIS:HB3	3:C:124:VAL:HG12	1.88	0.55
3:C:160:GLN:HE21	3:C:160:GLN:HA	1.72	0.55
7:G:23:PHE:O	7:G:26:THR:HB	2.07	0.55
11:Y:89:GLN:HG2	19:Y:414:HOH:O	2.06	0.54
3:Q:160:GLN:HE21	3:Q:160:GLN:HA	1.72	0.54
1:O:122:THR:HG22	2:P:128:ARG:HH21	1.73	0.54
2:P:124:HIS:HB3	3:Q:124:VAL:HG12	1.88	0.54
5:S:12:PHE:H	6:T:19:GLN:HE22	1.54	0.54
9:I:36:SER:HB2	10:J:126:VAL:HG11	1.90	0.53
14:N:168:SER:O	15:e:5:POL:H33	2.09	0.52
15:h:4:DCL:O	15:h:5:POL:O	2.26	0.52
14:b:168:SER:O	15:h:5:POL:H33	2.09	0.52
9:W:20:VAL:HG13	9:W:118:PRO:HB3	1.92	0.51
8:H:52:THR:O	8:H:56:THR:HB	2.11	0.51
10:J:16:ALA:HB2	10:J:161:LEU:HD21	1.93	0.51
11:K:170:TYR:O	15:d:5:POL:H33	2.10	0.51
1:A:122:THR:HG22	2:B:128:ARG:HH21	1.75	0.51
5:E:12:PHE:H	6:F:19:GLN:HE22	1.57	0.51
9:I:20:VAL:HG13	9:I:118:PRO:HB3	1.93	0.51
10:X:23:ARG:HG2	19:Y:415:HOH:O	2.11	0.51
10:X:16:ALA:HB2	10:X:161:LEU:HD21	1.93	0.51
9:I:10:ILE:HG21	9:I:141:ALA:HB3	1.94	0.50
9:W:10:ILE:HG21	9:W:141:ALA:HB3	1.93	0.50
4:D:88:ALA:HA	4:D:99:ILE:HG21	1.94	0.49
3:C:201:VAL:O	3:C:202:GLN:CB	2.61	0.49
3:Q:201:VAL:O	3:Q:202:GLN:CB	2.61	0.49
3:C:201:VAL:HG13	3:C:202:GLN:N	2.28	0.49
8:H:104:ASP:HB2	8:H:105:PRO:HD2	1.95	0.49
8:V:52:THR:O	8:V:56:THR:HB	2.12	0.49
9:W:9:GLY:HA3	9:W:41:LYS:HE2	1.95	0.49
9:W:36:SER:HB2	10:X:126:VAL:HG11	1.95	0.49
11:Y:49:ALA:HA	15:g:4:DCL:HD13	1.96	0.48
8:H:53:GLU:OE2	19:H:401:HOH:O	2.20	0.48
9:I:9:GLY:HA3	9:I:41:LYS:HE2	1.94	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:Q:201:VAL:HG13	3:Q:202:GLN:N	2.28	0.48
5:S:87:LEU:HD21	5:S:107:ALA:HB1	1.96	0.48
4:R:88:ALA:HA	4:R:99:ILE:HG21	1.94	0.48
10:J:21:VAL:HG11	11:K:122:LEU:HD11	1.96	0.47
3:Q:201:VAL:O	3:Q:202:GLN:HB2	2.14	0.47
3:C:201:VAL:O	3:C:202:GLN:HB2	2.14	0.47
11:K:100:MET:CE	11:K:127:PHE:HB2	2.38	0.47
8:V:104:ASP:HB2	8:V:105:PRO:HD2	1.95	0.47
10:J:1:MET:O	10:J:2:ASP:CB	2.60	0.47
2:B:146:GLN:HG2	3:C:57:ILE:HG21	1.95	0.47
12:L:8:ASN:HA	12:L:30:ILE:O	2.15	0.47
5:E:9:THR:HG21	5:E:119:THR:HA	1.97	0.47
5:S:9:THR:HG21	5:S:119:THR:HA	1.97	0.47
12:Z:8:ASN:HA	12:Z:30:ILE:O	2.14	0.47
17:G:302:CL:CL	8:H:69:TYR:OH	2.70	0.46
10:J:67:TYR:CE1	10:J:75:LEU:HD13	2.50	0.46
5:E:87:LEU:HD21	5:E:107:ALA:HB1	1.96	0.46
14:N:171:GLY:HA2	13:a:219:TRP:CH2	2.50	0.46
2:P:93:HIS:HB3	2:P:113:ARG:HH21	1.80	0.46
10:X:21:VAL:HG11	11:Y:122:LEU:HD11	1.98	0.46
1:O:14:PRO:HA	2:P:23:TYR:CD1	2.51	0.46
1:O:55:LEU:HB3	7:U:159:ALA:O	2.16	0.46
1:O:119:GLN:O	1:O:122:THR:HB	2.16	0.46
10:X:67:TYR:CE1	10:X:75:LEU:HD13	2.51	0.46
2:B:93:HIS:HB3	2:B:113:ARG:HH21	1.80	0.45
14:N:161:GLN:HE21	14:b:136:GLY:HA2	1.81	0.45
1:A:119:GLN:O	1:A:122:THR:HB	2.16	0.45
13:M:219:TRP:CH2	14:b:171:GLY:HA2	2.52	0.45
10:J:1:MET:HA	10:J:34:LYS:HE3	1.99	0.45
13:M:127:LEU:HG	13:M:142:LEU:HD12	1.99	0.45
11:Y:53:GLN:O	11:Y:57:THR:HG23	2.17	0.45
9:W:20:VAL:HG23	9:W:189:ILE:HB	1.99	0.45
1:A:149:GLN:O	1:A:156:TYR:HA	2.16	0.45
3:C:169:VAL:HG23	3:C:196:SER:HB2	1.99	0.45
11:K:53:GLN:O	11:K:57:THR:HG23	2.17	0.45
1:O:149:GLN:O	1:O:156:TYR:HA	2.17	0.45
12:Z:147:MET:N	12:Z:148:PRO:HD2	2.32	0.45
9:I:20:VAL:HG23	9:I:189:ILE:HB	1.98	0.45
10:X:1:MET:O	10:X:2:ASP:CB	2.59	0.44
13:a:127:LEU:HG	13:a:142:LEU:HD12	1.99	0.44
1:O:23:TYR:CD1	7:U:12:PRO:HA	2.52	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
8:V:49:ALA:CA	15:f:4:DCL:HD13	2.47	0.44
5:E:3:ASN:N	19:E:301:HOH:O	2.51	0.44
5:E:175:LEU:HA	5:E:178:PHE:CE2	2.53	0.44
11:K:5:ALA:HB3	11:K:100:MET:CE	2.48	0.44
5:S:175:LEU:HA	5:S:178:PHE:CE2	2.52	0.44
10:J:1:MET:HA	10:J:34:LYS:CE	2.48	0.44
8:H:84:LYS:HG3	8:H:85:GLN:N	2.33	0.44
12:L:147:MET:N	12:L:148:PRO:HD2	2.32	0.44
3:Q:169:VAL:HG23	3:Q:196:SER:HB2	1.99	0.44
11:Y:5:ALA:HB3	11:Y:100:MET:CE	2.48	0.44
3:Q:9:PHE:H	4:R:15:GLN:HE22	1.66	0.44
5:S:68:HIS:HE1	5:S:102:LEU:O	2.01	0.44
10:X:1:MET:HA	10:X:34:LYS:CE	2.47	0.44
2:P:151:ASN:HB2	2:P:152:PRO:HD2	2.00	0.43
6:T:155:GLY:HA3	7:U:59:THR:HG21	2.00	0.43
10:X:1:MET:HA	10:X:34:LYS:HE3	1.99	0.43
4:R:159:TYR:CE2	5:S:56:SER:HB3	2.52	0.43
5:E:68:HIS:HE1	5:E:102:LEU:O	2.01	0.43
6:T:228:LYS:HE3	6:T:228:LYS:HB2	1.79	0.43
8:V:84:LYS:HG3	8:V:85:GLN:N	2.33	0.43
2:B:14:PRO:HA	3:C:20:TYR:CD1	2.54	0.43
3:C:198:LEU:HA	3:C:201:VAL:HG12	2.00	0.43
2:B:180:LYS:O	2:B:183:MET:HB2	2.18	0.43
3:Q:198:LEU:HA	3:Q:201:VAL:HG12	2.01	0.43
2:P:6:ASP:OD2	3:Q:4:ARG:HG3	2.19	0.43
2:B:151:ASN:HB2	2:B:152:PRO:HD2	2.01	0.43
11:K:37:ILE:HG23	11:K:60:GLY:HA2	2.00	0.43
14:N:136:GLY:HA2	14:b:161:GLN:HE21	1.83	0.43
3:Q:11:PRO:HA	4:R:18:TYR:CD1	2.54	0.43
7:U:26:THR:HG21	7:U:131:ILE:HD12	2.01	0.43
1:O:7:PHE:HB3	3:Q:2:TYR:CE1	2.54	0.43
2:P:151:ASN:HB2	2:P:152:PRO:CD	2.49	0.43
11:Y:100:MET:CE	11:Y:127:PHE:HB2	2.38	0.43
14:b:19:ARG:NH1	14:b:167:GLY:O	2.48	0.43
7:G:78:ILE:N	7:G:79:PRO:CD	2.82	0.42
7:U:78:ILE:N	7:U:79:PRO:CD	2.82	0.42
7:G:187:GLU:HG2	7:G:192:LYS:HB2	2.00	0.42
11:K:33:LYS:HE2	15:d:4:DCL:HG	2.00	0.42
2:P:180:LYS:O	2:P:183:MET:HB2	2.19	0.42
2:B:151:ASN:HB2	2:B:152:PRO:CD	2.49	0.42
7:G:26:THR:HG21	7:G:131:ILE:HD12	2.01	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:U:187:GLU:HG2	7:U:192:LYS:HB2	2.00	0.42
11:Y:37:ILE:HG23	11:Y:60:GLY:HA2	2.00	0.42
1:O:115:ALA:HB1	1:O:154:GLY:O	2.20	0.42
13:a:27:LEU:HD21	13:a:34:LEU:HD22	2.02	0.42
1:A:115:ALA:HB1	1:A:154:GLY:O	2.20	0.42
2:P:50:LYS:O	2:P:51:VAL:C	2.62	0.42
3:C:11:PRO:HA	4:D:18:TYR:CD1	2.55	0.41
4:R:138:GLY:HA2	4:R:214:ILE:HG12	2.02	0.41
2:B:50:LYS:O	2:B:51:VAL:C	2.63	0.41
5:S:131:LEU:HB2	5:S:146:PHE:HB3	2.02	0.41
4:R:91:HIS:HB3	4:R:99:ILE:CG2	2.50	0.41
13:M:96:LEU:O	13:M:100:MET:HG2	2.21	0.41
4:D:91:HIS:HB3	4:D:99:ILE:CG2	2.50	0.41
10:J:119:ILE:HG12	10:J:125:LYS:HG3	2.01	0.41
11:K:86:LEU:C	11:K:86:LEU:HD13	2.46	0.41
10:X:119:ILE:HG12	10:X:125:LYS:HG3	2.01	0.41
11:Y:86:LEU:C	11:Y:86:LEU:HD13	2.46	0.41
4:D:138:GLY:HA2	4:D:214:ILE:HG12	2.02	0.41
5:E:201:ARG:C	5:E:203:GLU:H	2.29	0.41
4:R:160:ASN:HB3	4:R:179:TRP:CE2	2.56	0.41
15:e:4:DCL:O	15:e:5:POL:O	2.27	0.41
2:B:6:ASP:OD2	3:C:4:ARG:HG3	2.21	0.41
12:L:31:THR:HG23	12:L:36:ASN:HD21	1.86	0.41
5:S:201:ARG:C	5:S:203:GLU:H	2.29	0.41
8:V:50:ALA:HB3	9:W:126:ILE:HD12	2.03	0.41
12:Z:31:THR:HG23	12:Z:36:ASN:HD21	1.85	0.41
13:a:96:LEU:O	13:a:100:MET:HG2	2.20	0.41
13:M:27:LEU:HD21	13:M:34:LEU:HD22	2.03	0.41
2:B:183:MET:HE1	2:B:191:LEU:HD12	2.03	0.40
5:E:42:HIS:HB2	5:E:188:LEU:HD12	2.03	0.40
6:F:228:LYS:HE3	6:F:228:LYS:HB2	1.79	0.40
10:J:152:MET:HE2	10:J:156:GLU:HB3	2.03	0.40
1:O:12:PHE:H	2:P:20:GLN:HE22	1.69	0.40
11:Y:25:TRP:CH2	12:Z:144:SER:HA	2.55	0.40
9:I:65:MET:HE1	9:I:93:SER:HB3	2.04	0.40
5:S:42:HIS:HB2	5:S:188:LEU:HD12	2.03	0.40
5:S:77:ALA:N	5:S:78:PRO:CD	2.85	0.40
5:E:131:LEU:HB2	5:E:146:PHE:HB3	2.02	0.40
10:X:19:LYS:HD3	10:X:180:ILE:HG13	2.03	0.40
3:C:9:PHE:H	4:D:15:GLN:HE22	1.69	0.40
10:X:152:MET:HE2	10:X:156:GLU:HB3	2.02	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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	248/250 (99%)	242 (98%)	5 (2%)	1 (0%)	30	54
1	O	248/250 (99%)	242 (98%)	5 (2%)	1 (0%)	30	54
2	B	242/258 (94%)	234 (97%)	7 (3%)	1 (0%)	30	54
2	P	242/258 (94%)	234 (97%)	7 (3%)	1 (0%)	30	54
3	C	238/254 (94%)	230 (97%)	5 (2%)	3 (1%)	9	25
3	Q	238/254 (94%)	230 (97%)	5 (2%)	3 (1%)	9	25
4	D	231/260 (89%)	227 (98%)	4 (2%)	0	100	100
4	R	231/260 (89%)	227 (98%)	4 (2%)	0	100	100
5	E	229/234 (98%)	223 (97%)	6 (3%)	0	100	100
5	S	229/234 (98%)	223 (97%)	6 (3%)	0	100	100
6	F	241/288 (84%)	234 (97%)	7 (3%)	0	100	100
6	T	241/288 (84%)	234 (97%)	7 (3%)	0	100	100
7	G	239/252 (95%)	235 (98%)	4 (2%)	0	100	100
7	U	239/252 (95%)	235 (98%)	4 (2%)	0	100	100
8	H	220/232 (95%)	214 (97%)	6 (3%)	0	100	100
8	V	220/232 (95%)	214 (97%)	6 (3%)	0	100	100
9	I	202/205 (98%)	195 (96%)	7 (4%)	0	100	100
9	W	202/205 (98%)	195 (96%)	7 (4%)	0	100	100
10	J	193/198 (98%)	188 (97%)	4 (2%)	1 (0%)	24	48
10	X	193/198 (98%)	188 (97%)	4 (2%)	1 (0%)	24	48
11	K	210/212 (99%)	206 (98%)	4 (2%)	0	100	100
11	Y	210/212 (99%)	206 (98%)	4 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
12	L	220/222 (99%)	216 (98%)	4 (2%)	0	100	100
12	Z	220/222 (99%)	216 (98%)	4 (2%)	0	100	100
13	M	228/246 (93%)	221 (97%)	7 (3%)	0	100	100
13	a	231/246 (94%)	224 (97%)	7 (3%)	0	100	100
14	N	194/196 (99%)	187 (96%)	7 (4%)	0	100	100
14	b	194/196 (99%)	187 (96%)	7 (4%)	0	100	100
15	c	2/5 (40%)	2 (100%)	0	0	100	100
15	d	2/5 (40%)	2 (100%)	0	0	100	100
15	e	2/5 (40%)	2 (100%)	0	0	100	100
15	f	2/5 (40%)	2 (100%)	0	0	100	100
15	g	2/5 (40%)	2 (100%)	0	0	100	100
15	h	2/5 (40%)	2 (100%)	0	0	100	100
All	All	6285/6644 (95%)	6119 (97%)	154 (2%)	12 (0%)	43	68

All (12) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	51	VAL
3	C	202	GLN
10	J	2	ASP
2	P	51	VAL
3	Q	202	GLN
10	X	2	ASP
3	C	205	ALA
3	Q	205	ALA
1	A	3	ASP
1	O	3	ASP
3	C	183	PRO
3	Q	183	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 X-ray entries followed by that with respect to entries of similar resolution.

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	209/209 (100%)	202 (97%)	7 (3%)	33	63
1	O	209/209 (100%)	202 (97%)	7 (3%)	33	63
2	B	203/216 (94%)	193 (95%)	10 (5%)	22	49
2	P	203/216 (94%)	193 (95%)	10 (5%)	22	49
3	C	212/226 (94%)	203 (96%)	9 (4%)	26	55
3	Q	212/226 (94%)	203 (96%)	9 (4%)	26	55
4	D	194/215 (90%)	178 (92%)	16 (8%)	10	27
4	R	194/215 (90%)	178 (92%)	16 (8%)	10	27
5	E	190/193 (98%)	179 (94%)	11 (6%)	18	42
5	S	190/193 (98%)	179 (94%)	11 (6%)	18	42
6	F	201/239 (84%)	191 (95%)	10 (5%)	22	48
6	T	201/239 (84%)	191 (95%)	10 (5%)	22	48
7	G	206/210 (98%)	196 (95%)	10 (5%)	22	49
7	U	206/210 (98%)	195 (95%)	11 (5%)	20	46
8	H	181/190 (95%)	175 (97%)	6 (3%)	33	63
8	V	181/190 (95%)	175 (97%)	6 (3%)	33	63
9	I	172/173 (99%)	166 (96%)	6 (4%)	32	61
9	W	172/173 (99%)	166 (96%)	6 (4%)	32	61
10	J	173/175 (99%)	168 (97%)	5 (3%)	37	67
10	X	173/175 (99%)	168 (97%)	5 (3%)	37	67
11	K	169/169 (100%)	163 (96%)	6 (4%)	31	60
11	Y	169/169 (100%)	163 (96%)	6 (4%)	31	60
12	L	185/185 (100%)	177 (96%)	8 (4%)	26	54
12	Z	185/185 (100%)	177 (96%)	8 (4%)	26	54
13	M	196/208 (94%)	188 (96%)	8 (4%)	27	56
13	a	199/208 (96%)	191 (96%)	8 (4%)	28	56
14	N	162/162 (100%)	156 (96%)	6 (4%)	30	59
14	b	162/162 (100%)	156 (96%)	6 (4%)	30	59
15	c	2/2 (100%)	2 (100%)	0	100	100
15	d	2/2 (100%)	2 (100%)	0	100	100
15	e	2/2 (100%)	2 (100%)	0	100	100
15	f	2/2 (100%)	2 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
15	g	2/2 (100%)	2 (100%)	0	100	100
15	h	2/2 (100%)	2 (100%)	0	100	100
All	All	5321/5552 (96%)	5084 (96%)	237 (4%)	24	52

All (237) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	A	17	LYS
1	A	29	LYS
1	A	61	LEU
1	A	122	THR
1	A	157	PHE
1	A	250	LEU
2	B	50	LYS
2	B	52	THR
2	B	54	THR
2	B	55	LEU
2	B	58	GLN
2	B	79	LEU
2	B	102	ASN
2	B	114	LEU
2	B	184	LYS
2	B	191	LEU
3	C	4	ARG
3	C	38	ASN
3	C	52	LEU
3	C	147	GLN
3	C	160	GLN
3	C	169	VAL
3	C	180	LYS
3	C	203	THR
3	C	213	VAL
4	D	20	LEU
4	D	40	LEU
4	D	51	LEU
4	D	60	VAL
4	D	99	ILE
4	D	102	GLU
4	D	117	GLU
4	D	125	LEU

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Mol	Chain	Res	Type
4	D	176	LEU
4	D	190	LEU
4	D	193	LEU
4	D	197	LYS
4	D	214	ILE
4	D	235	LEU
4	D	236	LYS
4	D	242	GLU
5	E	9	THR
5	E	10	VAL
5	E	25	LEU
5	E	29	LYS
5	E	54	GLU
5	E	55	LEU
5	E	71	LEU
5	E	174	THR
5	E	188	LEU
5	E	207	VAL
5	E	231	LYS
6	F	14	ASP
6	F	59	LYS
6	F	68	ARG
6	F	123	ASN
6	F	172	LEU
6	F	181	GLU
6	F	203	ASN
6	F	206	LYS
6	F	221	ASN
6	F	228	LYS
7	G	26	THR
7	G	83	ASN
7	G	115	LEU
7	G	122	ARG
7	G	125	MET
7	G	166	GLN
7	G	181	LYS
7	G	207	THR
7	G	235	ARG
7	G	236	LEU
8	H	34	LEU
8	H	43	CYS
8	H	56	THR

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Mol	Chain	Res	Type
8	H	68	LEU
8	H	127	LEU
8	H	196	ARG
9	I	20	VAL
9	I	37	ASN
9	I	171	LEU
9	I	182	TRP
9	I	191	LYS
9	I	192	ASP
10	J	23	ARG
10	J	35	THR
10	J	75	LEU
10	J	144	LEU
10	J	174	MET
11	K	4	LEU
11	K	7	ARG
11	K	9	GLN
11	K	35	ILE
11	K	106	ARG
11	K	118	ASP
12	L	1	GLN
12	L	13	LEU
12	L	23	LEU
12	L	49	ASN
12	L	106	TYR
12	L	136	CYS
12	L	150	LEU
12	L	167	LYS
13	M	43	ILE
13	M	48	ASN
13	M	70	LEU
13	M	104	ARG
13	M	187	ARG
13	M	212	LEU
13	M	215	GLU
13	M	223	LYS
14	N	2	SER
14	N	9	LYS
14	N	21	THR
14	N	22	THR
14	N	119	VAL
14	N	178	LEU

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Mol	Chain	Res	Type
1	O	1	MET
1	O	17	LYS
1	O	29	LYS
1	O	61	LEU
1	O	122	THR
1	O	157	PHE
1	O	250	LEU
2	P	50	LYS
2	P	52	THR
2	P	54	THR
2	P	55	LEU
2	P	58	GLN
2	P	79	LEU
2	P	102	ASN
2	P	114	LEU
2	P	184	LYS
2	P	191	LEU
3	Q	4	ARG
3	Q	38	ASN
3	Q	52	LEU
3	Q	147	GLN
3	Q	160	GLN
3	Q	169	VAL
3	Q	180	LYS
3	Q	203	THR
3	Q	213	VAL
4	R	20	LEU
4	R	40	LEU
4	R	51	LEU
4	R	60	VAL
4	R	99	ILE
4	R	102	GLU
4	R	117	GLU
4	R	125	LEU
4	R	176	LEU
4	R	190	LEU
4	R	193	LEU
4	R	197	LYS
4	R	214	ILE
4	R	235	LEU
4	R	236	LYS
4	R	242	GLU

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Mol	Chain	Res	Type
5	S	9	THR
5	S	10	VAL
5	S	25	LEU
5	S	29	LYS
5	S	54	GLU
5	S	55	LEU
5	S	71	LEU
5	S	174	THR
5	S	188	LEU
5	S	207	VAL
5	S	231	LYS
6	T	14	ASP
6	T	59	LYS
6	T	68	ARG
6	T	123	ASN
6	T	172	LEU
6	T	181	GLU
6	T	203	ASN
6	T	206	LYS
6	T	221	ASN
6	T	228	LYS
7	U	26	THR
7	U	83	ASN
7	U	115	LEU
7	U	122	ARG
7	U	125	MET
7	U	166	GLN
7	U	171	THR
7	U	181	LYS
7	U	207	THR
7	U	235	ARG
7	U	236	LEU
8	V	34	LEU
8	V	43	CYS
8	V	56	THR
8	V	68	LEU
8	V	127	LEU
8	V	196	ARG
9	W	20	VAL
9	W	37	ASN
9	W	171	LEU
9	W	182	TRP

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Mol	Chain	Res	Type
9	W	191	LYS
9	W	192	ASP
10	X	23	ARG
10	X	35	THR
10	X	75	LEU
10	X	144	LEU
10	X	174	MET
11	Y	4	LEU
11	Y	7	ARG
11	Y	9	GLN
11	Y	35	ILE
11	Y	106	ARG
11	Y	118	ASP
12	Z	1	GLN
12	Z	13	LEU
12	Z	23	LEU
12	Z	49	ASN
12	Z	106	TYR
12	Z	136	CYS
12	Z	150	LEU
12	Z	167	LYS
13	a	43	ILE
13	a	48	ASN
13	a	70	LEU
13	a	104	ARG
13	a	187	ARG
13	a	212	LEU
13	a	215	GLU
13	a	223	LYS
14	b	2	SER
14	b	9	LYS
14	b	21	THR
14	b	22	THR
14	b	119	VAL
14	b	178	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (160) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	30	GLN
1	A	94	HIS
1	A	149	GLN

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Mol	Chain	Res	Type
2	B	20	GLN
2	B	58	GLN
2	B	119	GLN
2	B	123	GLN
2	B	124	HIS
2	B	176	GLN
2	B	232	GLN
3	C	38	ASN
3	C	53	GLN
3	C	115	GLN
3	C	116	GLN
3	C	120	GLN
3	C	147	GLN
3	C	160	GLN
3	C	233	GLN
4	D	15	GLN
4	D	91	HIS
4	D	100	ASN
4	D	106	GLN
4	D	160	ASN
4	D	217	GLN
4	D	225	ASN
5	E	68	HIS
5	E	85	ASN
5	E	99	ASN
5	E	116	GLN
5	E	118	ASN
5	E	120	GLN
5	E	147	GLN
5	E	151	ASN
5	E	165	GLN
5	E	184	ASN
6	F	19	GLN
6	F	86	ASN
6	F	117	GLN
6	F	191	GLN
7	G	83	ASN
7	G	114	ASN
7	G	117	GLN
7	G	121	GLN
7	G	166	GLN
7	G	167	GLN

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Mol	Chain	Res	Type
7	G	175	ASN
8	H	30	ASN
8	H	57	GLN
8	H	66	HIS
8	H	86	HIS
8	H	114	HIS
8	H	165	ASN
8	H	172	ASN
8	H	189	ASN
9	I	88	GLN
10	J	37	GLN
10	J	55	GLN
10	J	61	GLN
10	J	63	ASN
10	J	146	HIS
10	J	147	HIS
11	K	9	GLN
11	K	85	ASN
11	K	133	GLN
11	K	143	ASN
11	K	176	ASN
11	K	190	ASN
11	K	208	ASN
12	L	36	ASN
12	L	70	ASN
12	L	80	ASN
12	L	153	GLN
12	L	158	ASN
12	L	165	ASN
12	L	197	GLN
13	M	2	GLN
13	M	48	ASN
13	M	102	GLN
14	N	38	HIS
14	N	69	GLN
14	N	141	ASN
14	N	161	GLN
1	O	30	GLN
1	O	94	HIS
1	O	149	GLN
2	P	20	GLN
2	P	58	GLN

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Mol	Chain	Res	Type
2	P	119	GLN
2	P	123	GLN
2	P	124	HIS
2	P	176	GLN
2	P	232	GLN
3	Q	38	ASN
3	Q	115	GLN
3	Q	116	GLN
3	Q	120	GLN
3	Q	147	GLN
3	Q	160	GLN
4	R	15	GLN
4	R	91	HIS
4	R	100	ASN
4	R	160	ASN
4	R	217	GLN
4	R	225	ASN
5	S	68	HIS
5	S	85	ASN
5	S	92	ASN
5	S	99	ASN
5	S	116	GLN
5	S	118	ASN
5	S	120	GLN
5	S	147	GLN
5	S	151	ASN
5	S	165	GLN
5	S	184	ASN
6	T	19	GLN
6	T	86	ASN
6	T	117	GLN
7	U	28	GLN
7	U	30	ASN
7	U	83	ASN
7	U	114	ASN
7	U	117	GLN
7	U	121	GLN
7	U	167	GLN
7	U	175	ASN
8	V	30	ASN
8	V	57	GLN
8	V	86	HIS

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Mol	Chain	Res	Type
8	V	165	ASN
8	V	189	ASN
9	W	37	ASN
9	W	63	ASN
9	W	88	GLN
10	X	37	GLN
10	X	55	GLN
10	X	61	GLN
10	X	63	ASN
10	X	86	GLN
10	X	146	HIS
10	X	147	HIS
11	Y	9	GLN
11	Y	85	ASN
11	Y	133	GLN
11	Y	143	ASN
11	Y	176	ASN
11	Y	208	ASN
12	Z	70	ASN
12	Z	76	HIS
12	Z	79	HIS
12	Z	80	ASN
12	Z	153	GLN
12	Z	158	ASN
12	Z	165	ASN
12	Z	197	GLN
13	a	102	GLN
14	b	38	HIS
14	b	69	GLN
14	b	141	ASN
14	b	161	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

6 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	$\# Z > 2$
15	DCL	e	4	14,15	7,7,7	0.71	0	6,8,8	0.98	0
15	DCL	d	4	11,15	7,7,7	0.80	0	6,8,8	1.05	0
15	DCL	c	4	8,15	7,7,7	0.72	0	6,8,8	0.94	0
15	DCL	h	4	14,15	7,7,7	0.71	0	6,8,8	0.99	0
15	DCL	g	4	11,15	7,7,7	0.65	0	6,8,8	1.29	1 (16%)
15	DCL	f	4	8,15	7,7,7	0.59	0	6,8,8	1.20	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
15	DCL	e	4	14,15	-	3/6/6/6	-
15	DCL	d	4	11,15	-	2/6/6/6	-
15	DCL	c	4	8,15	-	4/6/6/6	-
15	DCL	h	4	14,15	-	3/6/6/6	-
15	DCL	g	4	11,15	-	3/6/6/6	-
15	DCL	f	4	8,15	-	4/6/6/6	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
15	g	4	DCL	CB-CA-C	-2.22	106.60	111.47

There are no chirality outliers.

All (19) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
15	c	4	DCL	N-CA-CB-CG
15	c	4	DCL	C-CA-CB-CG
15	d	4	DCL	N-CA-CB-CG
15	d	4	DCL	C-CA-CB-CG

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Mol	Chain	Res	Type	Atoms
15	e	4	DCL	N-CA-CB-CG
15	e	4	DCL	C-CA-CB-CG
15	f	4	DCL	N-CA-CB-CG
15	f	4	DCL	C-CA-CB-CG
15	g	4	DCL	N-CA-CB-CG
15	h	4	DCL	N-CA-CB-CG
15	h	4	DCL	C-CA-CB-CG
15	f	4	DCL	CA-CB-CG-CD2
15	f	4	DCL	CA-CB-CG-CD1
15	e	4	DCL	CA-CB-CG-CD2
15	h	4	DCL	CA-CB-CG-CD2
15	c	4	DCL	CA-CB-CG-CD2
15	g	4	DCL	C-CA-CB-CG
15	g	4	DCL	CA-CB-CG-CD2
15	c	4	DCL	CA-CB-CG-CD1

There are no ring outliers.

6 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
15	e	4	DCL	1	0
15	d	4	DCL	1	0
15	c	4	DCL	1	0
15	h	4	DCL	1	0
15	g	4	DCL	1	0
15	f	4	DCL	2	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 16 ligands modelled in this entry, 12 are monoatomic - leaving 4 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	$\# Z > 2$
18	MES	K	302	-	12,12,12	2.33	1 (8%)	15,16,16	1.12	1 (6%)
18	MES	Y	301	-	12,12,12	2.32	1 (8%)	15,16,16	1.09	1 (6%)
18	MES	V	301	-	12,12,12	2.29	1 (8%)	15,16,16	1.13	1 (6%)
18	MES	H	301	-	12,12,12	2.29	1 (8%)	15,16,16	1.11	1 (6%)

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
18	MES	K	302	-	-	0/6/14/14	0/1/1/1
18	MES	Y	301	-	-	0/6/14/14	0/1/1/1
18	MES	V	301	-	-	2/6/14/14	0/1/1/1
18	MES	H	301	-	-	1/6/14/14	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
18	Y	301	MES	C8-S	-7.78	1.66	1.77
18	K	302	MES	C8-S	-7.76	1.66	1.77
18	H	301	MES	C8-S	-7.63	1.66	1.77
18	V	301	MES	C8-S	-7.63	1.66	1.77

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
18	K	302	MES	O3S-S-C8	2.42	110.75	106.00
18	H	301	MES	O2S-S-C8	2.37	110.31	106.73
18	V	301	MES	O1S-S-C8	2.28	110.17	106.73
18	Y	301	MES	O3S-S-C8	2.14	110.19	106.00

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
18	V	301	MES	C8-C7-N4-C5

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Mol	Chain	Res	Type	Atoms
18	H	301	MES	C7-C8-S-O1S
18	V	301	MES	C8-C7-N4-C3

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	250/250 (100%)	-0.24	2 (0%) 82 81	40, 53, 89, 131	0
1	O	250/250 (100%)	-0.19	5 (2%) 65 62	45, 61, 102, 133	0
2	B	244/258 (94%)	-0.09	7 (2%) 53 50	39, 57, 106, 163	0
2	P	244/258 (94%)	-0.02	8 (3%) 49 45	45, 63, 111, 165	0
3	C	240/254 (94%)	-0.09	7 (2%) 53 50	41, 62, 125, 156	0
3	Q	240/254 (94%)	0.17	10 (4%) 40 37	49, 76, 151, 192	0
4	D	235/260 (90%)	-0.22	3 (1%) 75 73	45, 63, 96, 136	0
4	R	235/260 (90%)	-0.10	3 (1%) 75 73	47, 66, 101, 146	0
5	E	231/234 (98%)	-0.02	1 (0%) 88 87	50, 70, 103, 147	0
5	S	231/234 (98%)	0.19	5 (2%) 62 59	52, 75, 112, 147	0
6	F	243/288 (84%)	-0.09	6 (2%) 58 55	45, 65, 114, 142	0
6	T	243/288 (84%)	-0.00	5 (2%) 63 61	42, 70, 119, 152	0
7	G	241/252 (95%)	-0.19	2 (0%) 82 81	41, 58, 99, 153	0
7	U	241/252 (95%)	-0.24	3 (1%) 76 75	41, 57, 90, 131	0
8	H	222/232 (95%)	-0.31	0 100 100	40, 54, 79, 110	0
8	V	222/232 (95%)	-0.25	2 (0%) 81 80	41, 57, 83, 126	0
9	I	204/205 (99%)	-0.48	0 100 100	36, 48, 76, 98	0
9	W	204/205 (99%)	-0.39	0 100 100	36, 52, 81, 107	0
10	J	195/198 (98%)	-0.43	1 (0%) 87 86	38, 51, 76, 124	0
10	X	195/198 (98%)	-0.36	1 (0%) 87 86	42, 53, 78, 133	0
11	K	212/212 (100%)	-0.46	0 100 100	37, 51, 78, 91	0
11	Y	212/212 (100%)	-0.41	0 100 100	37, 51, 77, 106	0
12	L	222/222 (100%)	-0.42	0 100 100	39, 54, 77, 102	0
12	Z	222/222 (100%)	-0.47	0 100 100	37, 52, 80, 102	0

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
13	M	230/246 (93%)	-0.33	2 (0%) 81 80	36, 56, 80, 90	0
13	a	233/246 (94%)	-0.35	2 (0%) 81 80	38, 53, 75, 93	0
14	N	196/196 (100%)	-0.38	0 100 100	38, 51, 80, 108	0
14	b	196/196 (100%)	-0.41	1 (0%) 87 86	39, 51, 79, 102	0
15	c	2/5 (40%)	-0.08	0 100 100	60, 60, 60, 65	0
15	d	2/5 (40%)	0.45	0 100 100	66, 66, 66, 67	0
15	e	2/5 (40%)	0.06	0 100 100	59, 59, 59, 62	0
15	f	2/5 (40%)	0.57	0 100 100	64, 64, 64, 67	0
15	g	2/5 (40%)	-0.14	0 100 100	65, 65, 65, 66	0
15	h	2/5 (40%)	0.63	0 100 100	62, 62, 62, 69	0
All	All	6345/6644 (95%)	-0.22	76 (1%) 76 75	36, 58, 101, 192	0

All (76) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
10	J	1	MET	5.4
10	X	1	MET	4.6
2	B	51	VAL	4.6
3	Q	50	LEU	4.3
2	P	219	ALA	4.3
1	A	1	MET	4.3
1	O	1	MET	3.8
3	Q	205	ALA	3.6
2	B	242	GLY	3.3
2	P	51	VAL	3.2
13	a	1	THR	3.2
2	B	218	GLY	3.2
4	D	240	ALA	3.1
3	Q	51	LYS	3.0
3	Q	206	LYS	3.0
1	A	201	GLU	2.9
13	M	1	THR	2.9
2	B	219	ALA	2.9
5	S	122	TYR	2.9
1	O	4	ARG	2.8
2	B	58	GLN	2.8
3	C	50	LEU	2.8
6	T	241	LYS	2.7

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Mol	Chain	Res	Type	RSRZ
2	P	1	GLY	2.7
6	T	14	ASP	2.7
6	F	59	LYS	2.7
4	R	241	ALA	2.6
13	M	230	THR	2.6
3	Q	234	ILE	2.6
6	T	204	LYS	2.6
3	Q	201	VAL	2.6
1	O	53	SER	2.5
3	Q	49	THR	2.5
2	P	218	GLY	2.5
2	P	222	GLY	2.5
7	U	2	GLY	2.4
2	B	217	LYS	2.4
2	P	60	THR	2.4
6	T	243	ILE	2.4
7	G	2	GLY	2.4
13	a	233	ILE	2.4
6	F	202	ASP	2.4
6	F	215	CYS	2.4
5	S	233	ILE	2.3
3	Q	238	LYS	2.3
4	R	238	LYS	2.3
8	V	208	GLY	2.3
1	O	249	ALA	2.3
3	C	240	GLU	2.3
5	S	218	ASP	2.3
7	U	222	ASP	2.3
4	R	242	GLU	2.2
3	C	205	ALA	2.2
4	D	242	GLU	2.2
14	b	103	ASP	2.2
6	F	39	ASN	2.2
2	B	54	THR	2.1
3	C	239	GLN	2.1
7	G	242	GLN	2.1
1	O	240	SER	2.1
6	T	205	GLU	2.1
5	S	231	LYS	2.1
7	U	24	LYS	2.1
3	Q	52	LEU	2.1
8	V	222	ASP	2.1

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Mol	Chain	Res	Type	RSRZ
3	C	51	LYS	2.1
2	P	56	LEU	2.1
3	C	49	THR	2.1
5	S	52	ALA	2.0
2	P	52	THR	2.0
3	Q	203	THR	2.0
5	E	122	TYR	2.0
4	D	241	ALA	2.0
6	F	241	LYS	2.0
3	C	203	THR	2.0
6	F	176	VAL	2.0

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

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
15	DCL	c	4	8/8	0.94	0.12	62,66,68,68	0
15	DCL	f	4	8/8	0.94	0.11	67,70,75,77	0
15	DCL	h	4	8/8	0.94	0.11	58,66,69,70	0
15	DCL	d	4	8/8	0.95	0.12	57,68,69,70	0
15	DCL	e	4	8/8	0.95	0.10	59,61,63,63	0
15	DCL	g	4	8/8	0.97	0.09	62,70,78,80	0

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
18	MES	V	301	12/12	0.75	0.25	104,128,144,145	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
18	MES	H	301	12/12	0.76	0.21	85,114,133,135	0
17	CL	b	201	1/1	0.87	0.19	83,83,83,83	0
18	MES	K	302	12/12	0.89	0.15	71,80,84,85	0
16	MG	G	301	1/1	0.90	0.07	69,69,69,69	0
18	MES	Y	301	12/12	0.93	0.13	66,79,82,83	0
16	MG	N	201	1/1	0.95	0.10	55,55,55,55	0
16	MG	I	301	1/1	0.96	0.05	56,56,56,56	0
17	CL	e	101	1/1	0.96	0.21	30,30,30,30	0
17	CL	G	302	1/1	0.96	0.22	30,30,30,30	0
16	MG	Z	301	1/1	0.97	0.07	72,72,72,72	0
16	MG	L	301	1/1	0.97	0.07	57,57,57,57	0
17	CL	N	202	1/1	0.97	0.06	51,51,51,51	0
17	CL	U	301	1/1	0.97	0.16	30,30,30,30	0
16	MG	K	301	1/1	0.97	0.09	55,55,55,55	0
16	MG	I	302	1/1	1.00	0.03	49,49,49,49	0

6.5 Other polymers [i](#)

There are no such residues in this entry.