



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 11, 2023 – 09:19 am GMT

PDB ID : 4Y6V
Title : Yeast 20S proteasome in complex with Ac-PAE-ep
Authors : Huber, E.M.; Groll, M.
Deposited on : 2015-02-13
Resolution : 2.80 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 : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

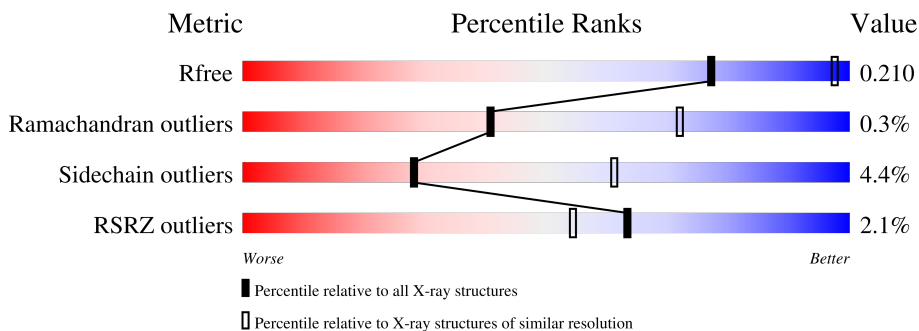
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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}	130704	3140 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)
RSRZ outliers	127900	3078 (2.80-2.80)

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	2% (poor fit), 98% (0-3 outliers), 0% (4+ outliers), 0% (not modelled)
1	O	250	2% (poor fit), 98% (0-3 outliers), 0% (4+ outliers), 0% (not modelled)
2	B	258	3% (poor fit), 90% (0-3 outliers), 5% (4 outliers), 5% (not modelled)
2	P	258	4% (poor fit), 90% (0-3 outliers), 5% (4 outliers), 5% (not modelled)
3	C	254	4% (poor fit), 88% (0-3 outliers), 6% (4 outliers), 6% (not modelled)
3	Q	254	7% (poor fit), 88% (0-3 outliers), 6% (4 outliers), 6% (not modelled)

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Mol	Chain	Length	Quality of chain
4	D	260	 2% 85% 5% 10%
4	R	260	 % 85% 5% 10%
5	E	234	 % 93% 6% .
5	S	234	 3% 93% 6% .
6	F	288	 2% 81% . 16%
6	T	288	 3% 81% . 16%
7	G	252	 2% 91% 5% .
7	U	252	 2% 91% 5% .
8	H	232	 3% 95% . .
8	V	232	 3% 96% . .
9	I	205	 . 98% .
9	W	205	 % 98% .
10	J	198	 2% 95% . .
10	X	198	 2% 95% . .
11	K	212	 . 95%
11	Y	212	 . 96%
12	L	222	 % 96% .
12	Z	222	 % 96% .
13	M	246	 . 5% 91%
13	a	246	 . 5% 91%
14	N	196	 2% 98% .
14	b	196	 2% 98% .
15	c	4	 50% 50%
15	d	4	 50% 50%

2 Entry composition

There are 17 unique types of molecules in this entry. The entry contains 49759 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
			Total	C	N	O	S			
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
			Total	C	N	O	S			
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
			Total	C	N	O	S			
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
			Total	C	N	O	S			
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	226	Total	C	N	O	S	0	0	0
			1719	1082	298	332	7			
8	V	226	Total	C	N	O	S	0	0	0
			1719	1082	298	332	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	233	Total	C	N	O	S	0	0	0
			1824	1154	312	351	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-PAE-ep.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
15	c	4	Total	C	N	O	0	0	0
			28	18	3	7			
15	d	4	Total	C	N	O	0	0	0
			28	18	3	7			

- Molecule 16 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

- Molecule 17 is water.

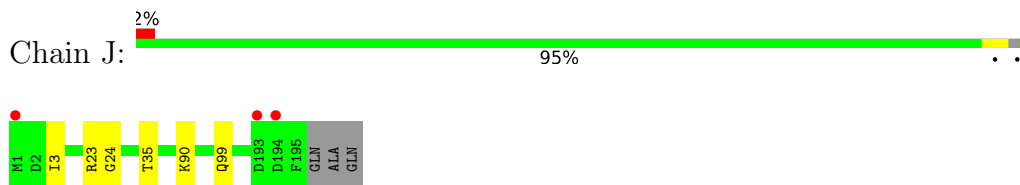
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
17	A	16	Total 16	O 16	0	0
17	B	18	Total 18	O 18	0	0
17	C	18	Total 18	O 18	0	0
17	D	6	Total 6	O 6	0	0
17	E	3	Total 3	O 3	0	0
17	F	10	Total 10	O 10	0	0
17	G	11	Total 11	O 11	0	0
17	H	13	Total 13	O 13	0	0
17	I	12	Total 12	O 12	0	0
17	J	13	Total 13	O 13	0	0
17	K	12	Total 12	O 12	0	0
17	L	15	Total 15	O 15	0	0
17	M	17	Total 17	O 17	0	0

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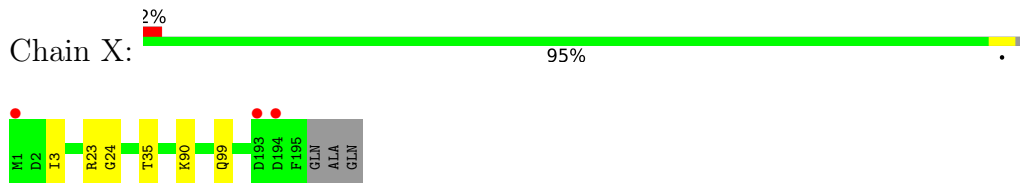
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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
17	N	14	Total O 14 14	0	0
17	O	1	Total O 1 1	0	0
17	P	7	Total O 7 7	0	0
17	Q	12	Total O 12 12	0	0
17	R	10	Total O 10 10	0	0
17	S	4	Total O 4 4	0	0
17	T	8	Total O 8 8	0	0
17	U	14	Total O 14 14	0	0
17	V	16	Total O 16 16	0	0
17	W	8	Total O 8 8	0	0
17	X	13	Total O 13 13	0	0
17	Y	15	Total O 15 15	0	0
17	Z	16	Total O 16 16	0	0
17	a	15	Total O 15 15	0	0
17	b	11	Total O 11 11	0	0
17	d	2	Total O 2 2	0	0

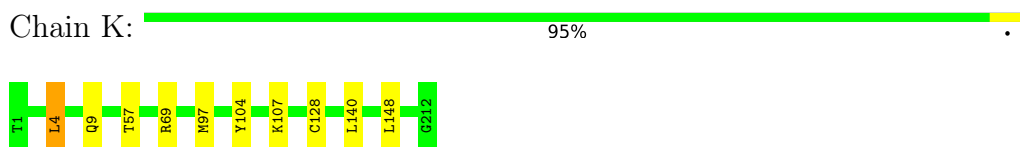
- Molecule 10: Proteasome subunit beta type-4



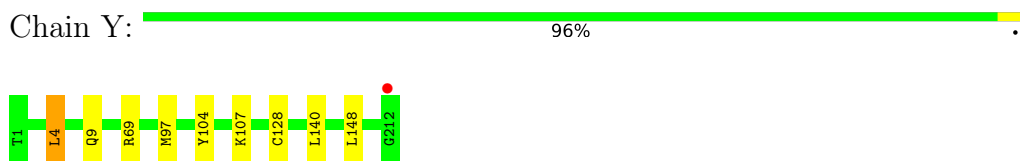
- Molecule 10: Proteasome subunit beta type-4



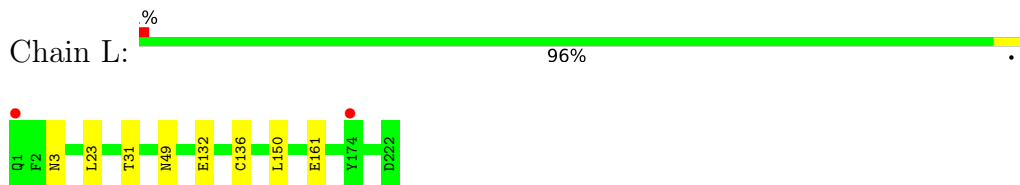
- Molecule 11: Proteasome subunit beta type-5



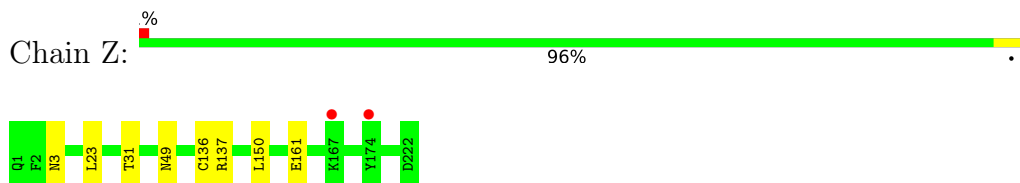
- Molecule 11: Proteasome subunit beta type-5



- Molecule 12: Proteasome subunit beta type-6

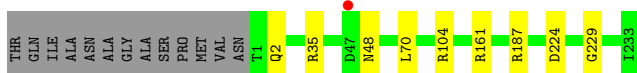


- Molecule 12: Proteasome subunit beta type-6



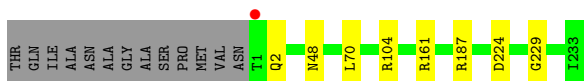
- Molecule 13: Proteasome subunit beta type-7





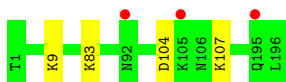
- Molecule 13: Proteasome subunit beta type-7

Chain a: 91% 5%



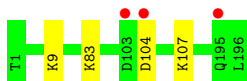
- Molecule 14: Proteasome subunit beta type-1

Chain N: 98% 2%



- Molecule 14: Proteasome subunit beta type-1

Chain b: 98% 2%



- Molecule 15: Ac-PAE-ep

Chain c: 50% 50%



- Molecule 15: Ac-PAE-ep

Chain d: 50% 50%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	135.85Å 301.22Å 145.77Å 90.00° 113.15° 90.00°	Depositor
Resolution (Å)	15.00 – 2.80 15.00 – 2.80	Depositor EDS
% Data completeness (in resolution range)	98.2 (15.00-2.80) 98.2 (15.00-2.80)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.08 (at 2.81Å)	Xtrriage
Refinement program	REFMAC 5.7.0032	Depositor
R, R_{free}	0.191 , 0.209 0.193 , 0.210	Depositor DCC
R_{free} test set	12850 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	56.2	Xtrriage
Anisotropy	0.033	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 44.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	49759	wwPDB-VP
Average B, all atoms (Å ²)	60.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.21% 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: GAU, N7P, POL, MG

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	0.28	0/1952	0.47	0/2642
1	O	0.28	0/1952	0.47	0/2642
2	B	0.29	0/1934	0.51	0/2618
2	P	0.28	0/1934	0.51	0/2618
3	C	0.28	0/1910	0.52	0/2586
3	Q	0.28	0/1910	0.52	0/2586
4	D	0.28	0/1837	0.49	0/2475
4	R	0.27	0/1837	0.49	0/2475
5	E	0.28	0/1800	0.48	0/2433
5	S	0.28	0/1800	0.49	0/2433
6	F	0.28	0/1932	0.46	0/2609
6	T	0.28	0/1932	0.46	0/2609
7	G	0.28	0/1945	0.48	0/2634
7	U	0.28	0/1945	0.47	0/2634
8	H	0.34	0/1750	0.50	0/2373
8	V	0.32	0/1750	0.50	0/2373
9	I	0.28	0/1611	0.48	0/2174
9	W	0.29	0/1611	0.49	0/2174
10	J	0.27	0/1589	0.49	0/2142
10	X	0.27	0/1589	0.48	0/2142
11	K	0.32	0/1681	0.54	1/2274 (0.0%)
11	Y	0.30	0/1681	0.52	1/2274 (0.0%)
12	L	0.29	0/1795	0.49	0/2420
12	Z	0.31	0/1795	0.49	0/2420
13	M	0.29	0/1855	0.52	0/2514
13	a	0.30	0/1855	0.52	0/2514
14	N	0.44	0/1541	0.50	0/2087
14	b	0.33	0/1541	0.49	0/2087
15	c	0.92	0/4	0.97	0/4
15	d	0.97	0/4	1.02	0/4
All	All	0.30	0/50272	0.49	2/67970 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
11	K	4	LEU	CA-CB-CG	5.28	127.45	115.30
11	Y	4	LEU	CA-CB-CG	5.26	127.40	115.30

There are no chirality outliers.

There are no planarity outliers.

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 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%)	241 (97%)	6 (2%)	1 (0%)	34	66
1	O	248/250 (99%)	240 (97%)	7 (3%)	1 (0%)	34	66
2	B	242/258 (94%)	234 (97%)	4 (2%)	4 (2%)	9	29
2	P	242/258 (94%)	234 (97%)	4 (2%)	4 (2%)	9	29
3	C	238/254 (94%)	231 (97%)	4 (2%)	3 (1%)	12	36
3	Q	238/254 (94%)	231 (97%)	4 (2%)	3 (1%)	12	36
4	D	231/260 (89%)	229 (99%)	2 (1%)	0	100	100
4	R	231/260 (89%)	229 (99%)	2 (1%)	0	100	100
5	E	229/234 (98%)	221 (96%)	8 (4%)	0	100	100
5	S	229/234 (98%)	221 (96%)	8 (4%)	0	100	100
6	F	241/288 (84%)	238 (99%)	3 (1%)	0	100	100
6	T	241/288 (84%)	238 (99%)	3 (1%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
7	G	239/252 (95%)	239 (100%)	0	0	100	100
7	U	239/252 (95%)	239 (100%)	0	0	100	100
8	H	224/232 (97%)	218 (97%)	6 (3%)	0	100	100
8	V	224/232 (97%)	218 (97%)	6 (3%)	0	100	100
9	I	202/205 (98%)	197 (98%)	5 (2%)	0	100	100
9	W	202/205 (98%)	196 (97%)	6 (3%)	0	100	100
10	J	193/198 (98%)	189 (98%)	3 (2%)	1 (0%)	29	61
10	X	193/198 (98%)	188 (97%)	4 (2%)	1 (0%)	29	61
11	K	210/212 (99%)	206 (98%)	4 (2%)	0	100	100
11	Y	210/212 (99%)	206 (98%)	4 (2%)	0	100	100
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	231/246 (94%)	223 (96%)	7 (3%)	1 (0%)	34	66
13	a	231/246 (94%)	223 (96%)	7 (3%)	1 (0%)	34	66
14	N	194/196 (99%)	190 (98%)	4 (2%)	0	100	100
14	b	194/196 (99%)	190 (98%)	4 (2%)	0	100	100
15	c	1/4 (25%)	1 (100%)	0	0	100	100
15	d	1/4 (25%)	1 (100%)	0	0	100	100
All	All	6286/6622 (95%)	6143 (98%)	123 (2%)	20 (0%)	41	72

All (20) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	51	VAL
2	B	222	GLY
3	C	202	GLN
2	P	51	VAL
2	P	222	GLY
3	Q	202	GLN
1	A	2	THR
3	C	205	ALA
1	O	2	THR
3	Q	205	ALA
2	B	218	GLY
2	B	220	ASN
2	P	218	GLY

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Mol	Chain	Res	Type
2	P	220	ASN
3	C	183	PRO
10	J	24	GLY
3	Q	183	PRO
10	X	24	GLY
13	M	229	GLY
13	a	229	GLY

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 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%)	204 (98%)	5 (2%)	49 81
1	O	209/209 (100%)	204 (98%)	5 (2%)	49 81
2	B	203/216 (94%)	195 (96%)	8 (4%)	32 66
2	P	203/216 (94%)	195 (96%)	8 (4%)	32 66
3	C	212/226 (94%)	199 (94%)	13 (6%)	18 48
3	Q	212/226 (94%)	199 (94%)	13 (6%)	18 48
4	D	194/215 (90%)	180 (93%)	14 (7%)	14 38
4	R	194/215 (90%)	180 (93%)	14 (7%)	14 38
5	E	190/193 (98%)	177 (93%)	13 (7%)	16 42
5	S	190/193 (98%)	177 (93%)	13 (7%)	16 42
6	F	201/239 (84%)	191 (95%)	10 (5%)	24 56
6	T	201/239 (84%)	191 (95%)	10 (5%)	24 56
7	G	206/210 (98%)	194 (94%)	12 (6%)	20 50
7	U	206/210 (98%)	194 (94%)	12 (6%)	20 50
8	H	185/190 (97%)	180 (97%)	5 (3%)	44 78
8	V	185/190 (97%)	181 (98%)	4 (2%)	52 83
9	I	172/173 (99%)	168 (98%)	4 (2%)	50 82
9	W	172/173 (99%)	169 (98%)	3 (2%)	60 87

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
10	J	173/175 (99%)	168 (97%)	5 (3%)	42	76
10	X	173/175 (99%)	168 (97%)	5 (3%)	42	76
11	K	169/169 (100%)	159 (94%)	10 (6%)	19	49
11	Y	169/169 (100%)	160 (95%)	9 (5%)	22	54
12	L	185/185 (100%)	177 (96%)	8 (4%)	29	62
12	Z	185/185 (100%)	177 (96%)	8 (4%)	29	62
13	M	199/208 (96%)	191 (96%)	8 (4%)	31	65
13	a	199/208 (96%)	192 (96%)	7 (4%)	36	70
14	N	162/162 (100%)	158 (98%)	4 (2%)	47	80
14	b	162/162 (100%)	158 (98%)	4 (2%)	47	80
All	All	5320/5540 (96%)	5086 (96%)	234 (4%)	28	61

All (234) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	59	GLU
1	A	62	SER
1	A	122	THR
1	A	157	PHE
1	A	250	LEU
2	B	50	LYS
2	B	55	LEU
2	B	79	LEU
2	B	113	ARG
2	B	119	GLN
2	B	186	ASP
2	B	191	LEU
2	B	238	LEU
3	C	4	ARG
3	C	38	ASN
3	C	49	THR
3	C	50	LEU
3	C	51	LYS
3	C	60	SER
3	C	147	GLN
3	C	160	GLN
3	C	169	VAL
3	C	175	LYS

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Mol	Chain	Res	Type
3	C	180	LYS
3	C	206	LYS
3	C	240	GLU
4	D	40	LEU
4	D	51	LEU
4	D	99	ILE
4	D	117	GLU
4	D	125	LEU
4	D	143	ASP
4	D	176	LEU
4	D	190	LEU
4	D	193	LEU
4	D	202	GLU
4	D	214	ILE
4	D	235	LEU
4	D	236	LYS
4	D	242	GLU
5	E	8	ASP
5	E	9	THR
5	E	29	LYS
5	E	55	LEU
5	E	71	LEU
5	E	99	ASN
5	E	116	GLN
5	E	184	ASN
5	E	188	LEU
5	E	202	ASP
5	E	207	VAL
5	E	208	ASP
5	E	231	LYS
6	F	117	GLN
6	F	123	ASN
6	F	139	LYS
6	F	172	LEU
6	F	181	GLU
6	F	201	GLU
6	F	202	ASP
6	F	207	ASP
6	F	214	TRP
6	F	240	GLN
7	G	13	GLU
7	G	26	THR

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Mol	Chain	Res	Type
7	G	75	ASN
7	G	83	ASN
7	G	115	LEU
7	G	117	GLN
7	G	122	ARG
7	G	125	MET
7	G	178	LYS
7	G	208	GLU
7	G	235	ARG
7	G	236	LEU
8	H	30	ASN
8	H	34	LEU
8	H	53	GLU
8	H	68	LEU
8	H	196	ARG
9	I	37	ASN
9	I	126	ILE
9	I	171	LEU
9	I	192	ASP
10	J	3	ILE
10	J	23	ARG
10	J	35	THR
10	J	90	LYS
10	J	99	GLN
11	K	4	LEU
11	K	9	GLN
11	K	57	THR
11	K	69	ARG
11	K	97	MET
11	K	104	TYR
11	K	107	LYS
11	K	128	CYS
11	K	140	LEU
11	K	148	LEU
12	L	3	ASN
12	L	23	LEU
12	L	31	THR
12	L	49	ASN
12	L	132	GLU
12	L	136	CYS
12	L	150	LEU
12	L	161	GLU

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Mol	Chain	Res	Type
13	M	2	GLN
13	M	35	ARG
13	M	48	ASN
13	M	70	LEU
13	M	104	ARG
13	M	161	ARG
13	M	187	ARG
13	M	224	ASP
14	N	9	LYS
14	N	83	LYS
14	N	104	ASP
14	N	107	LYS
1	O	59	GLU
1	O	62	SER
1	O	122	THR
1	O	157	PHE
1	O	250	LEU
2	P	50	LYS
2	P	55	LEU
2	P	79	LEU
2	P	113	ARG
2	P	119	GLN
2	P	186	ASP
2	P	191	LEU
2	P	238	LEU
3	Q	4	ARG
3	Q	38	ASN
3	Q	49	THR
3	Q	50	LEU
3	Q	51	LYS
3	Q	60	SER
3	Q	147	GLN
3	Q	160	GLN
3	Q	169	VAL
3	Q	175	LYS
3	Q	180	LYS
3	Q	206	LYS
3	Q	240	GLU
4	R	40	LEU
4	R	51	LEU
4	R	99	ILE
4	R	117	GLU

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Mol	Chain	Res	Type
4	R	125	LEU
4	R	143	ASP
4	R	176	LEU
4	R	190	LEU
4	R	193	LEU
4	R	202	GLU
4	R	214	ILE
4	R	235	LEU
4	R	236	LYS
4	R	242	GLU
5	S	8	ASP
5	S	9	THR
5	S	29	LYS
5	S	55	LEU
5	S	71	LEU
5	S	99	ASN
5	S	116	GLN
5	S	184	ASN
5	S	188	LEU
5	S	202	ASP
5	S	207	VAL
5	S	208	ASP
5	S	231	LYS
6	T	117	GLN
6	T	123	ASN
6	T	139	LYS
6	T	172	LEU
6	T	181	GLU
6	T	201	GLU
6	T	202	ASP
6	T	207	ASP
6	T	214	TRP
6	T	240	GLN
7	U	13	GLU
7	U	26	THR
7	U	75	ASN
7	U	83	ASN
7	U	115	LEU
7	U	117	GLN
7	U	122	ARG
7	U	125	MET
7	U	178	LYS

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Mol	Chain	Res	Type
7	U	208	GLU
7	U	235	ARG
7	U	236	LEU
8	V	30	ASN
8	V	34	LEU
8	V	68	LEU
8	V	196	ARG
9	W	37	ASN
9	W	171	LEU
9	W	192	ASP
10	X	3	ILE
10	X	23	ARG
10	X	35	THR
10	X	90	LYS
10	X	99	GLN
11	Y	4	LEU
11	Y	9	GLN
11	Y	69	ARG
11	Y	97	MET
11	Y	104	TYR
11	Y	107	LYS
11	Y	128	CYS
11	Y	140	LEU
11	Y	148	LEU
12	Z	3	ASN
12	Z	23	LEU
12	Z	31	THR
12	Z	49	ASN
12	Z	136	CYS
12	Z	137	ARG
12	Z	150	LEU
12	Z	161	GLU
13	a	2	GLN
13	a	48	ASN
13	a	70	LEU
13	a	104	ARG
13	a	161	ARG
13	a	187	ARG
13	a	224	ASP
14	b	9	LYS
14	b	83	LYS
14	b	104	ASP

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Mol	Chain	Res	Type
14	b	107	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (130) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	94	HIS
2	B	20	GLN
2	B	58	GLN
2	B	95	GLN
2	B	119	GLN
2	B	123	GLN
2	B	155	ASN
2	B	176	GLN
3	C	17	GLN
3	C	38	ASN
3	C	77	ASN
3	C	116	GLN
3	C	120	GLN
3	C	147	GLN
3	C	160	GLN
4	D	15	GLN
4	D	100	ASN
4	D	146	GLN
4	D	225	ASN
5	E	68	HIS
5	E	92	ASN
5	E	99	ASN
5	E	116	GLN
5	E	118	ASN
5	E	120	GLN
5	E	184	ASN
6	F	19	GLN
6	F	86	ASN
6	F	117	GLN
6	F	123	ASN
6	F	191	GLN
6	F	240	GLN
7	G	30	ASN
7	G	83	ASN
7	G	114	ASN
7	G	117	GLN
7	G	121	GLN

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Mol	Chain	Res	Type
7	G	166	GLN
7	G	167	GLN
7	G	175	ASN
8	H	30	ASN
8	H	66	HIS
8	H	165	ASN
8	H	172	ASN
8	H	189	ASN
9	I	37	ASN
10	J	55	GLN
10	J	146	HIS
11	K	85	ASN
11	K	176	ASN
11	K	190	ASN
11	K	208	ASN
12	L	3	ASN
12	L	49	ASN
12	L	55	ASN
12	L	70	ASN
13	M	18	ASN
13	M	48	ASN
13	M	102	GLN
13	M	179	ASN
13	M	194	ASN
13	M	213	GLN
14	N	161	GLN
1	O	94	HIS
2	P	20	GLN
2	P	58	GLN
2	P	95	GLN
2	P	119	GLN
2	P	123	GLN
2	P	176	GLN
3	Q	17	GLN
3	Q	38	ASN
3	Q	77	ASN
3	Q	116	GLN
3	Q	120	GLN
3	Q	147	GLN
3	Q	160	GLN
4	R	15	GLN
4	R	100	ASN

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Mol	Chain	Res	Type
4	R	146	GLN
4	R	225	ASN
5	S	59	GLN
5	S	68	HIS
5	S	92	ASN
5	S	99	ASN
5	S	116	GLN
5	S	120	GLN
5	S	151	ASN
5	S	184	ASN
6	T	19	GLN
6	T	86	ASN
6	T	117	GLN
6	T	123	ASN
6	T	191	GLN
6	T	240	GLN
7	U	30	ASN
7	U	83	ASN
7	U	114	ASN
7	U	117	GLN
7	U	121	GLN
7	U	166	GLN
7	U	167	GLN
7	U	175	ASN
8	V	30	ASN
8	V	35	HIS
8	V	66	HIS
8	V	165	ASN
8	V	172	ASN
8	V	189	ASN
9	W	37	ASN
10	X	55	GLN
10	X	86	GLN
11	Y	85	ASN
11	Y	176	ASN
11	Y	190	ASN
11	Y	208	ASN
12	Z	3	ASN
12	Z	49	ASN
12	Z	55	ASN
12	Z	70	ASN
12	Z	95	HIS

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Mol	Chain	Res	Type
12	Z	158	ASN
13	a	18	ASN
13	a	48	ASN
13	a	102	GLN
13	a	179	ASN
13	a	194	ASN
13	a	213	GLN
14	b	69	GLN
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 ⓘ

4 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	N7P	d	1	15	9,10,11	1.81	2 (22%)	9,13,15	2.11	2 (22%)
15	N7P	c	1	15	9,10,11	1.67	2 (22%)	9,13,15	2.13	4 (44%)
15	GAU	c	3	14,15	8,8,8	1.66	2 (25%)	8,9,9	1.36	1 (12%)
15	GAU	d	3	14,15	8,8,8	1.50	2 (25%)	8,9,9	1.77	2 (25%)

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	N7P	d	1	15	-	0/4/16/18	0/1/1/1
15	N7P	c	1	15	-	0/4/16/18	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
15	GAU	c	3	14,15	-	2/7/7/7	-
15	GAU	d	3	14,15	-	2/7/7/7	-

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
15	c	3	GAU	C-CA	3.76	1.58	1.52
15	c	1	N7P	CB-CA	-3.27	1.46	1.53
15	d	1	N7P	CA-N	-3.16	1.45	1.48
15	d	1	N7P	CB-CA	-3.15	1.46	1.53
15	d	3	GAU	C-CA	2.76	1.56	1.52
15	c	1	N7P	CG-CD	-2.74	1.42	1.51
15	c	3	GAU	OE2-CD	-2.46	1.22	1.30
15	d	3	GAU	OE2-CD	-2.24	1.23	1.30

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
15	d	1	N7P	CB-CA-C	-3.90	107.34	112.70
15	c	1	N7P	CB-CA-C	-3.72	107.58	112.70
15	d	1	N7P	O1-C1-N	3.49	124.45	120.64
15	c	1	N7P	O1-C1-N	3.41	124.35	120.64
15	d	3	GAU	CB-CA-N	-3.09	100.05	109.03
15	d	3	GAU	CG-CB-CA	-3.01	106.42	112.74
15	c	3	GAU	CB-CA-N	-2.58	101.53	109.03
15	c	1	N7P	CA-N-C1	2.54	127.49	121.26
15	c	1	N7P	CB-CG-CD	-2.25	98.60	104.98

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
15	c	3	GAU	O-C-CA-N
15	c	3	GAU	O-C-CA-CB
15	d	3	GAU	O-C-CA-CB
15	d	3	GAU	O-C-CA-N

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 7 ligands modelled in this entry, 7 are monoatomic - leaving 0 for Mogul analysis.

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.

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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%)	-0.43	6 (2%) 59 49	39, 50, 82, 120	0
1	O	250/250 (100%)	-0.32	6 (2%) 59 49	42, 58, 99, 128	0
2	B	244/258 (94%)	-0.33	8 (3%) 46 36	38, 56, 94, 143	0
2	P	244/258 (94%)	-0.21	10 (4%) 37 27	44, 60, 105, 149	0
3	C	240/254 (94%)	-0.17	11 (4%) 32 22	40, 62, 116, 140	0
3	Q	240/254 (94%)	0.01	17 (7%) 16 9	41, 68, 144, 163	0
4	D	235/260 (90%)	-0.33	4 (1%) 70 63	43, 62, 95, 133	0
4	R	235/260 (90%)	-0.27	3 (1%) 77 72	43, 64, 103, 137	0
5	E	231/234 (98%)	-0.25	3 (1%) 77 72	46, 66, 101, 148	0
5	S	231/234 (98%)	-0.16	7 (3%) 50 40	48, 72, 113, 161	0
6	F	243/288 (84%)	-0.36	7 (2%) 51 41	41, 57, 104, 132	0
6	T	243/288 (84%)	-0.26	8 (3%) 46 36	44, 67, 118, 148	0
7	G	241/252 (95%)	-0.42	4 (1%) 70 63	34, 52, 83, 132	0
7	U	241/252 (95%)	-0.39	6 (2%) 57 47	40, 56, 85, 129	0
8	H	226/232 (97%)	-0.33	7 (3%) 49 39	32, 48, 79, 143	0
8	V	226/232 (97%)	-0.29	7 (3%) 49 39	40, 52, 82, 157	0
9	I	204/205 (99%)	-0.62	1 (0%) 91 88	36, 47, 73, 96	0
9	W	204/205 (99%)	-0.61	2 (0%) 82 77	38, 49, 75, 101	0
10	J	195/198 (98%)	-0.47	3 (1%) 73 68	38, 51, 75, 132	0
10	X	195/198 (98%)	-0.47	3 (1%) 73 68	36, 51, 75, 137	0
11	K	212/212 (100%)	-0.43	0 100 100	36, 52, 72, 95	0
11	Y	212/212 (100%)	-0.45	1 (0%) 91 88	40, 51, 73, 94	0
12	L	222/222 (100%)	-0.48	2 (0%) 84 80	38, 53, 79, 114	0
12	Z	222/222 (100%)	-0.50	2 (0%) 84 80	38, 51, 78, 112	0

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
13	M	233/246 (94%)	-0.55	1 (0%) 92 91	35, 50, 71, 89	0
13	a	233/246 (94%)	-0.52	1 (0%) 92 91	35, 49, 68, 85	0
14	N	196/196 (100%)	-0.51	3 (1%) 73 68	35, 46, 71, 101	0
14	b	196/196 (100%)	-0.51	3 (1%) 73 68	36, 47, 72, 106	0
15	c	1/4 (25%)	0.08	0 100 100	65, 65, 65, 65	0
15	d	1/4 (25%)	-0.64	0 100 100	61, 61, 61, 61	0
All	All	6346/6622 (95%)	-0.37	136 (2%) 63 54	32, 55, 98, 163	0

All (136) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	Q	49	THR	8.0
10	X	1	MET	5.5
8	V	224	GLN	5.5
2	P	220	ASN	5.0
3	Q	206	LYS	5.0
2	B	221	ASP	5.0
10	X	194	ASP	4.9
2	B	218	GLY	4.7
3	Q	50	LEU	4.7
12	L	174	TYR	4.6
2	P	59	ASP	4.6
9	W	1	SER	4.6
3	Q	236	GLN	4.6
8	V	226	GLU	4.5
4	R	241	ALA	4.5
3	Q	239	GLN	4.4
7	U	242	GLN	4.4
5	S	202	ASP	4.2
3	Q	202	GLN	4.1
10	J	1	MET	4.1
2	B	51	VAL	4.1
8	V	221	CYS	4.0
3	C	206	LYS	4.0
3	C	49	THR	3.9
8	H	221	CYS	3.9
14	b	195	GLN	3.8
8	V	222	ASP	3.8
3	Q	240	GLU	3.8
8	V	225	GLU	3.7

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Mol	Chain	Res	Type	RSRZ
6	T	178	HIS	3.7
1	A	1	MET	3.7
2	P	221	ASP	3.6
3	C	205	ALA	3.6
9	I	1	SER	3.6
8	H	222	ASP	3.6
1	O	1	MET	3.4
2	P	51	VAL	3.4
2	P	218	GLY	3.4
1	O	2	THR	3.3
5	S	227	GLU	3.3
2	P	219	ALA	3.3
14	N	195	GLN	3.3
3	C	238	LYS	3.2
1	A	249	ALA	3.2
5	E	202	ASP	3.2
2	B	219	ALA	3.2
8	H	223	ILE	3.2
6	F	244	ASN	3.2
1	A	2	THR	3.1
13	a	1	THR	3.1
8	H	226	GLU	3.1
3	C	50	LEU	3.0
10	J	194	ASP	3.0
3	C	236	GLN	3.0
8	H	224	GLN	3.0
11	Y	212	GLY	3.0
12	Z	174	TYR	2.9
3	Q	225	GLU	2.9
1	O	249	ALA	2.9
3	C	239	GLN	2.9
1	O	250	LEU	2.9
2	B	217	LYS	2.8
7	G	3	TYR	2.8
8	V	223	ILE	2.8
9	W	192	ASP	2.8
3	C	216	ASP	2.8
6	T	181	GLU	2.7
13	M	47	ASP	2.6
3	C	60	SER	2.6
3	Q	48	SER	2.6
6	F	204	LYS	2.6

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Mol	Chain	Res	Type	RSRZ
2	B	59	ASP	2.6
2	P	222	GLY	2.6
7	U	206	GLY	2.5
4	R	1	ASP	2.5
2	B	220	ASN	2.5
3	Q	181	GLU	2.5
2	P	203	SER	2.5
1	O	201	GLU	2.5
2	P	52	THR	2.4
12	Z	167	LYS	2.4
5	E	233	ILE	2.4
5	S	30	GLN	2.4
2	P	182	ASP	2.4
3	C	240	GLU	2.4
7	U	188	GLU	2.4
6	F	205	GLU	2.4
5	S	165	GLN	2.4
7	G	222	ASP	2.4
1	A	203	GLU	2.3
3	Q	229	GLN	2.3
7	U	222	ASP	2.3
7	G	241	GLU	2.3
8	V	145	ASP	2.3
3	Q	55	THR	2.3
6	T	241	LYS	2.3
14	N	105	LYS	2.3
4	D	1	ASP	2.3
7	G	240	ALA	2.3
5	S	233	ILE	2.3
5	S	51	ASN	2.3
3	Q	238	LYS	2.3
6	F	181	GLU	2.3
5	E	123	GLY	2.3
4	R	217	GLN	2.3
6	F	180	PRO	2.3
4	D	47	THR	2.2
3	Q	204	GLY	2.2
1	O	52	SER	2.2
6	T	230	ASP	2.2
8	H	198	GLU	2.2
4	D	242	GLU	2.2
6	T	180	PRO	2.2

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Mol	Chain	Res	Type	RSRZ
6	T	243	ILE	2.2
7	U	3	TYR	2.2
6	F	2	THR	2.2
12	L	1	GLN	2.2
10	J	193	ASP	2.1
5	S	54	GLU	2.1
4	D	54	ASP	2.1
14	b	104	ASP	2.1
14	b	103	ASP	2.1
6	T	244	ASN	2.1
1	A	248	GLU	2.1
2	B	182	ASP	2.1
3	Q	180	LYS	2.1
6	F	215	CYS	2.0
6	T	205	GLU	2.0
3	Q	187	GLU	2.0
3	Q	203	THR	2.0
8	H	225	GLU	2.0
14	N	92	ASN	2.0
7	U	181	LYS	2.0
10	X	193	ASP	2.0
1	A	231	LYS	2.0
3	C	175	LYS	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	GAU	d	3	9/9	0.93	0.14	53,62,64,69	0
15	GAU	c	3	9/9	0.95	0.14	62,72,75,77	0
15	N7P	d	1	10/11	0.96	0.17	42,58,67,74	0
15	N7P	c	1	10/11	0.97	0.13	53,63,71,78	0

6.3 Carbohydrates [i](#)

There are no monosaccharides 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
16	MG	Z	301	1/1	0.89	0.34	57,57,57,57	0
16	MG	K	301	1/1	0.93	0.14	49,49,49,49	0
16	MG	N	201	1/1	0.97	0.09	45,45,45,45	0
16	MG	I	301	1/1	0.97	0.44	70,70,70,70	0
16	MG	L	301	1/1	0.98	0.07	58,58,58,58	0
16	MG	I	302	1/1	0.98	0.04	51,51,51,51	0
16	MG	G	301	1/1	0.98	0.07	50,50,50,50	0

6.5 Other polymers [i](#)

There are no such residues in this entry.