



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 06:03 PM UTC

PDB ID : 4JSQ / pdb\_00004jsq  
Title : Yeast 20S proteasome in complex with the dimerized linear mimetic of TMC-95A - yCP:4e  
Authors : Desvergne, A.; Genin, E.; Marechal, X.; Gallastegui, N.; Dufau, L.; Richy, N.; Groll, M.; Vidal, J.; Reboud-Ravaux, M.  
Deposited on : 2013-03-22  
Resolution : 2.80 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

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

A user guide is available at

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

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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

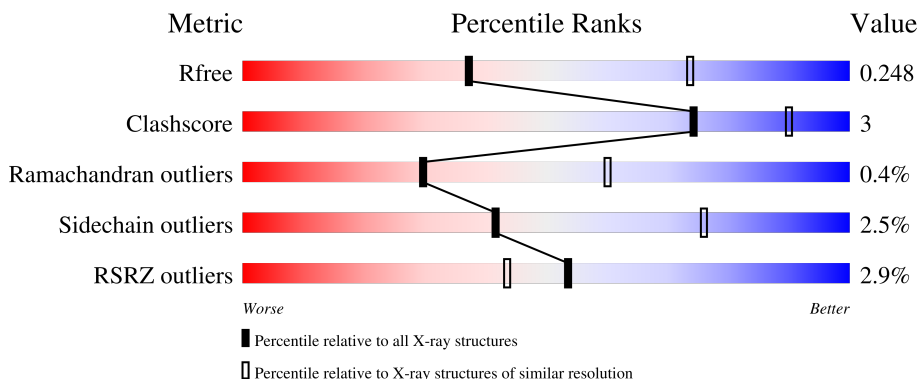
# 1 Overall quality at a glance

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))
$R_{free}$	180053	3866 (2.80-2.80)
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (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  $\geq 3$ , 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  $\leq 5\%$ . 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	 93% 7%
1	O	250	 92% 7%
2	B	258	 81% 13% 5%
2	P	258	 81% 13% 5%
3	C	254	 82% 12% 5%

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Mol	Chain	Length	Quality of chain
3	Q	254	 6% 85% 9% 5%
4	D	260	 3% 80% 12% 7%
4	R	260	 3% 82% 10% 7%
5	E	234	 2% 88% 10%
5	S	234	 6% 89% 9%
6	F	288	 3% 77% 7% 15%
6	T	288	 2% 77% 7% 15%
7	G	252	 2% 88% 8%
7	U	252	 2% 88% 8%
8	H	232	 89% 6%
8	V	232	 89% 6%
9	I	205	 88% 11%
9	W	205	 90% 10%
10	J	198	 4% 87% 12%
10	X	198	 3% 88% 12%
11	K	212	 5% 90% 9%
11	Y	212	 5% 91% 8%
12	L	222	 2% 91% 9%
12	Z	222	 2% 90% 9%
13	M	233	 87% 12%
13	a	233	 87% 12%
14	N	196	 97%
14	b	196	 2% 97%
15	c	8	 38% 25% 38%
15	d	8	 25% 25% 12% 38%

## 2 Entry composition

There are 17 unique types of molecules in this entry. The entry contains 51011 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	1915	1219	315	377	4	0	0	0
1	O	250	1915	1219	315	377	4	0	0	0

- 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	1904	1201	321	379	3	0	0	0
2	P	244	1904	1201	321	379	3	0	0	0

- 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	241	1890	1181	331	374	4	0	0	0
3	Q	241	1890	1181	331	374	4	0	0	0

- 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	242	1861	1162	314	378	7	0	0	0
4	R	242	1861	1162	314	378	7	0	0	0

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
5	E	233	Total 1795	C 1129	N 312	O 350	S 4	0	0	0
5	S	233	Total 1795	C 1129	N 312	O 350	S 4	0	0	0

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
6	F	244	Total 1896	C 1205	N 330	O 357	S 4	0	0	0
6	T	244	Total 1896	C 1205	N 330	O 357	S 4	0	0	0

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
7	G	243	Total 1921	C 1221	N 322	O 370	S 8	0	0	0
7	U	243	Total 1921	C 1221	N 322	O 370	S 8	0	0	0

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

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

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

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

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
10	J	198	Total 1585	C 1005	N 269	O 305	S 6	0	0	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
10	X	198	Total	C	N	O	S	0	0	0
			1585	1005	269	305	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			

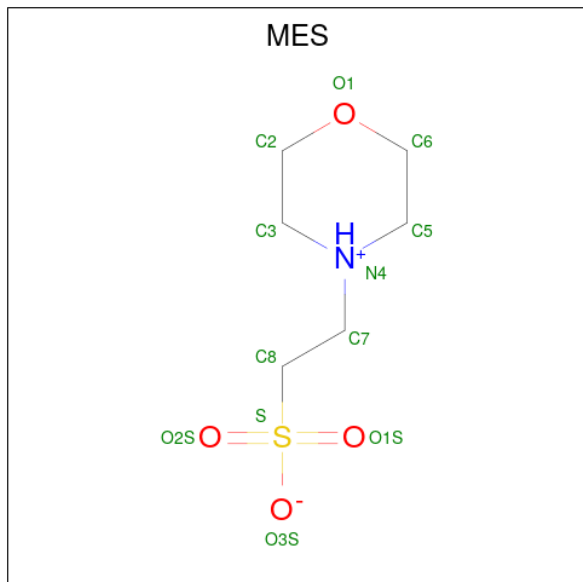
- Molecule 14 is a protein called Proteasome subunit beta type-1.

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 TMC-95A mimic ligand yCP:4e.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
15	c	5	Total	C	N	O	0	0	0
			56	43	6	7			
15	d	5	Total	C	N	O	0	0	0
			56	43	6	7			

- Molecule 16 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: C<sub>6</sub>H<sub>13</sub>NO<sub>4</sub>S).



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

- Molecule 17 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
17	A	59	Total	O	0	0
			59	59		
17	B	39	Total	O	0	0
			39	39		
17	C	43	Total	O	0	0
			43	43		
17	D	36	Total	O	0	0
			36	36		
17	E	21	Total	O	0	0
			21	21		
17	F	47	Total	O	0	0
			47	47		
17	G	60	Total	O	0	0
			60	60		
17	H	52	Total	O	0	0
			52	52		

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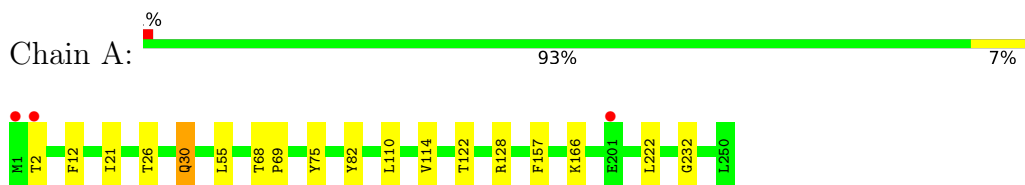
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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
17	I	64	Total O 64 64	0	0
17	J	53	Total O 53 53	0	0
17	K	48	Total O 48 48	0	0
17	L	54	Total O 54 54	0	0
17	M	81	Total O 81 81	0	0
17	N	58	Total O 58 58	0	0
17	O	34	Total O 34 34	0	0
17	P	30	Total O 30 30	0	0
17	Q	29	Total O 29 29	0	0
17	R	27	Total O 27 27	0	0
17	S	18	Total O 18 18	0	0
17	T	43	Total O 43 43	0	0
17	U	55	Total O 55 55	0	0
17	V	50	Total O 50 50	0	0
17	W	62	Total O 62 62	0	0
17	X	41	Total O 41 41	0	0
17	Y	50	Total O 50 50	0	0
17	Z	49	Total O 49 49	0	0
17	a	78	Total O 78 78	0	0
17	b	56	Total O 56 56	0	0

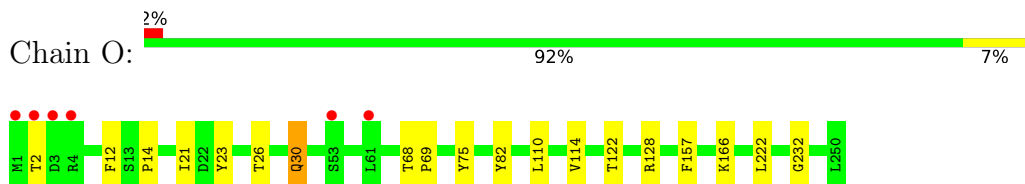
### 3 Residue-property plots [i](#)

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 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.

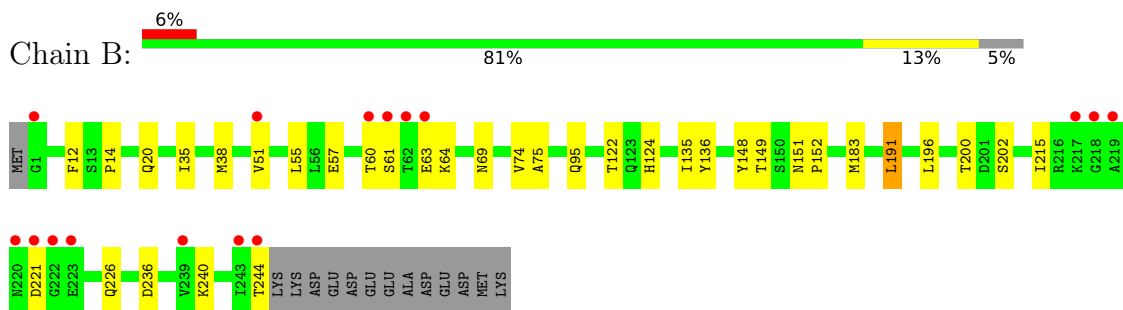
- Molecule 1: Proteasome subunit alpha type-2



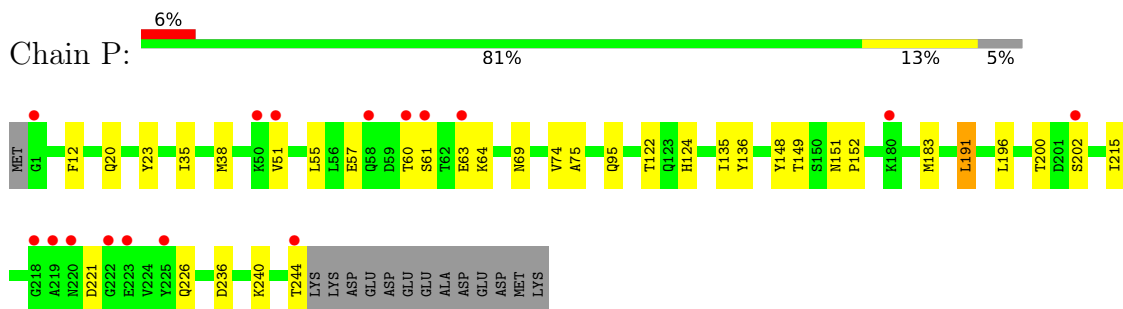
- Molecule 1: Proteasome subunit alpha type-2



- Molecule 2: Proteasome subunit alpha type-3

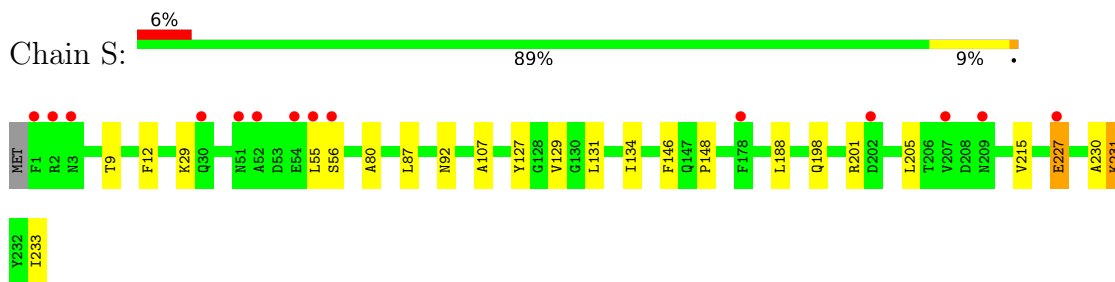


- Molecule 2: Proteasome subunit alpha type-3

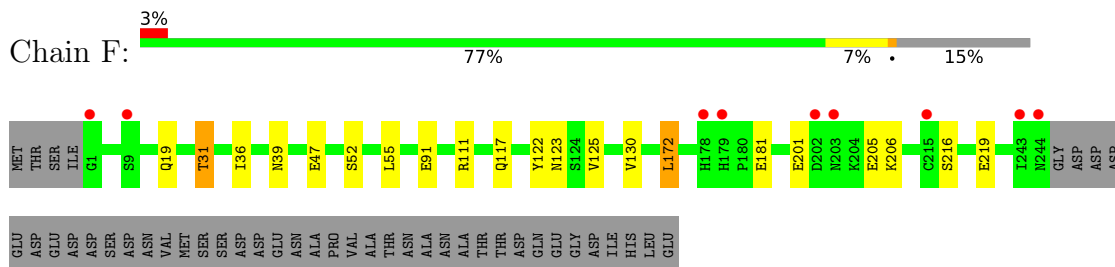


- Molecule 3: Proteasome subunit alpha type-4

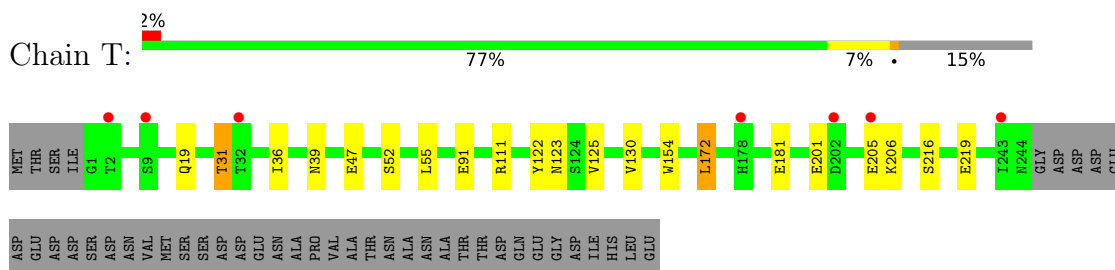




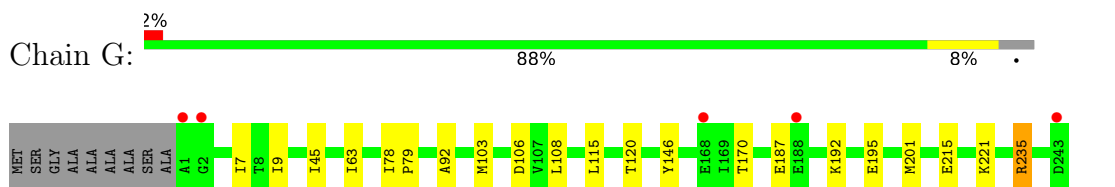
- Molecule 6: Probable proteasome subunit alpha type-7



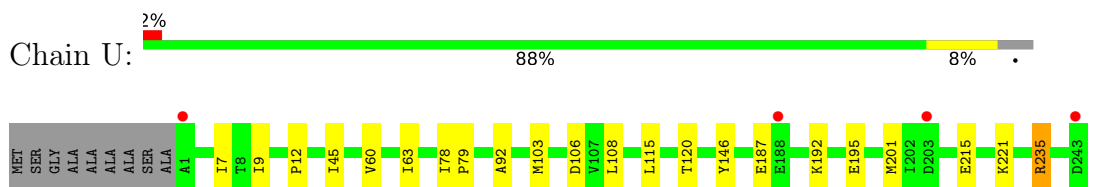
- Molecule 6: Probable proteasome subunit alpha type-7



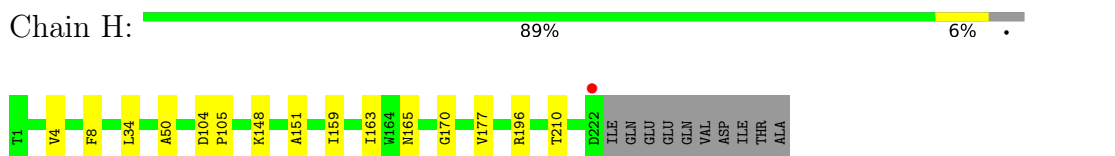
- Molecule 7: Proteasome subunit alpha type-1



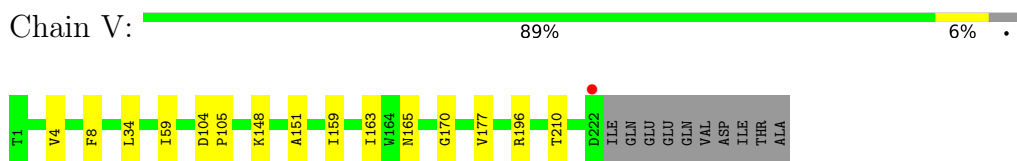
- Molecule 7: Proteasome subunit alpha type-1



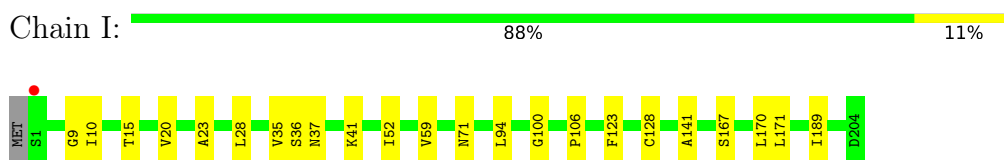
- Molecule 8: Proteasome subunit beta type-2



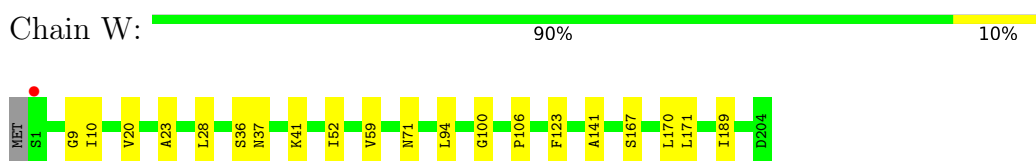
- Molecule 8: Proteasome subunit beta type-2



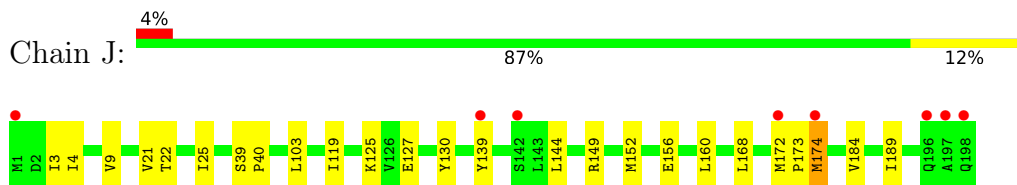
- Molecule 9: Proteasome subunit beta type-3



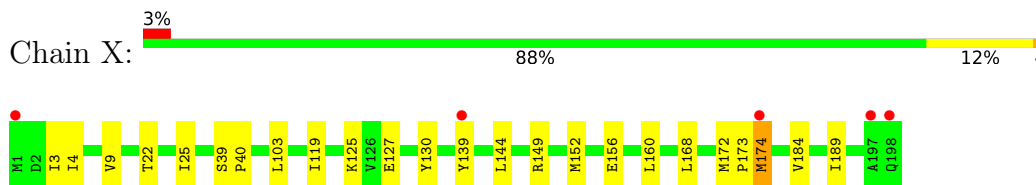
- Molecule 9: Proteasome subunit beta type-3



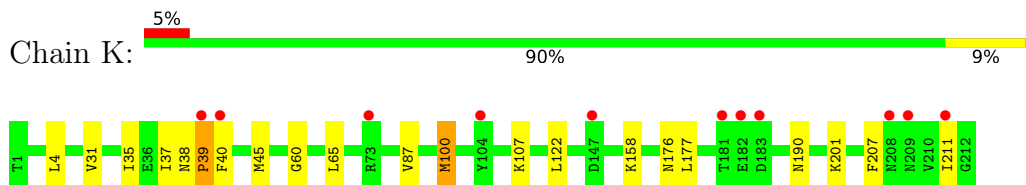
- Molecule 10: Proteasome subunit beta type-4



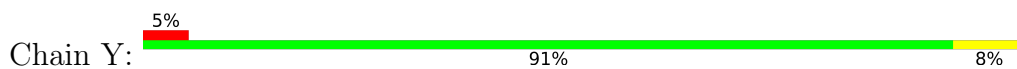
- Molecule 10: Proteasome subunit beta type-4

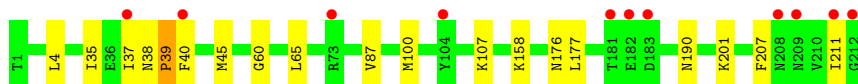


- Molecule 11: Proteasome subunit beta type-5



- Molecule 11: Proteasome subunit beta type-5

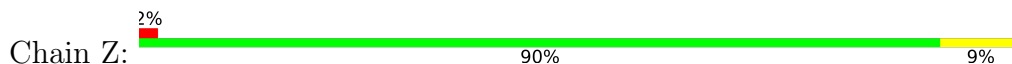




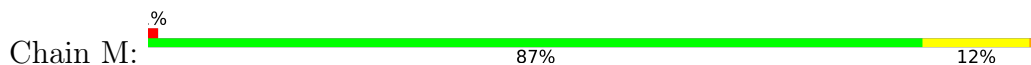
- Molecule 12: Proteasome subunit beta type-6



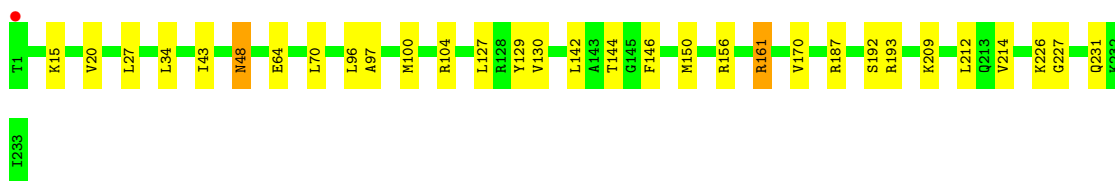
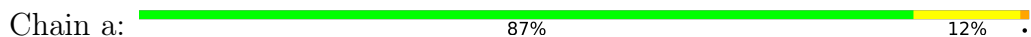
- Molecule 12: Proteasome subunit beta type-6



- Molecule 13: Proteasome subunit beta type-7



- Molecule 13: Proteasome subunit beta type-7



- Molecule 14: Proteasome subunit beta type-1

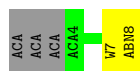


- Molecule 14: Proteasome subunit beta type-1

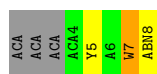
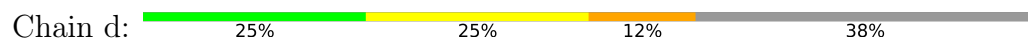




- Molecule 15: TMC-95A mimic ligand yCP:4e



- Molecule 15: TMC-95A mimic ligand yCP:4e



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	135.77Å 300.22Å 144.26Å 90.00° 112.86° 90.00°	Depositor
Resolution (Å)	15.00 – 2.80 15.00 – 2.80	Depositor EDS
% Data completeness (in resolution range)	99.1 (15.00-2.80) 98.6 (15.00-2.80)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.37 (at 2.81Å)	Xtrriage
Refinement program	REFMAC	Depositor
R, $R_{free}$	0.235 , 0.241 0.241 , 0.248	Depositor DCC
$R_{free}$ test set	12835 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	57.1	Xtrriage
Anisotropy	0.218	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 38.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	51011	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	73.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.64% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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 [i](#)

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

Bond lengths and bond angles in the following residue types are not validated in this section: RE0, MES, ABN, ACA, TY5

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	0.49	0/1952	0.77	0/2642
1	O	0.49	0/1952	0.77	0/2642
2	B	0.46	0/1934	0.74	0/2618
2	P	0.46	0/1934	0.74	0/2618
3	C	0.47	0/1919	0.77	0/2598
3	Q	0.47	0/1919	0.77	0/2598
4	D	0.53	0/1886	0.75	0/2541
4	R	0.53	0/1886	0.75	0/2541
5	E	0.48	0/1823	0.74	0/2463
5	S	0.48	0/1823	0.74	0/2463
6	F	0.58	0/1936	0.78	0/2614
6	T	0.58	0/1936	0.78	0/2614
7	G	0.49	0/1959	0.75	0/2652
7	U	0.48	0/1959	0.75	0/2652
8	H	0.61	0/1715	0.75	0/2326
8	V	0.62	0/1715	0.75	0/2326
9	I	0.45	0/1611	0.73	0/2174
9	W	0.45	0/1611	0.73	0/2174
10	J	0.48	0/1613	0.74	0/2173
10	X	0.48	0/1613	0.74	0/2173
11	K	0.58	0/1681	0.74	0/2274
11	Y	0.58	0/1681	0.74	0/2274
12	L	0.51	0/1795	0.72	0/2420
12	Z	0.51	0/1795	0.72	0/2420
13	M	0.47	0/1855	0.73	0/2514
13	a	0.47	0/1855	0.73	0/2514
14	N	0.52	0/1541	0.74	0/2087
14	b	0.52	0/1541	0.74	0/2087
15	c	0.61	0/4	0.76	0/4
15	d	0.61	0/4	0.75	0/4
All	All	0.51	0/50448	0.75	0/68200

There are no bond length outliers.

There are no bond angle outliers.

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	10	0
1	O	1915	0	1929	10	0
2	B	1904	0	1904	17	0
2	P	1904	0	1904	17	0
3	C	1890	0	1903	19	0
3	Q	1890	0	1903	14	0
4	D	1861	0	1839	18	0
4	R	1861	0	1839	13	0
5	E	1795	0	1800	17	0
5	S	1795	0	1800	15	0
6	F	1896	0	1889	11	0
6	T	1896	0	1889	11	0
7	G	1921	0	1913	10	0
7	U	1921	0	1913	11	0
8	H	1684	0	1688	8	0
8	V	1684	0	1688	7	0
9	I	1581	0	1574	13	0
9	W	1581	0	1574	10	0
10	J	1585	0	1590	17	0
10	X	1585	0	1590	15	0
11	K	1644	0	1595	11	0
11	Y	1644	0	1595	8	0
12	L	1757	0	1711	13	0
12	Z	1757	0	1711	14	0
13	M	1824	0	1832	18	0
13	a	1824	0	1832	18	0
14	N	1512	0	1481	3	0
14	b	1512	0	1481	3	0
15	c	56	0	42	2	0
15	d	56	0	42	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
16	K	12	0	13	0	0
16	Y	12	0	13	0	0
17	A	59	0	0	0	0
17	B	39	0	0	0	0
17	C	43	0	0	0	0
17	D	36	0	0	0	0
17	E	21	0	0	0	0
17	F	47	0	0	0	0
17	G	60	0	0	0	0
17	H	52	0	0	0	0
17	I	64	0	0	0	0
17	J	53	0	0	2	0
17	K	48	0	0	0	0
17	L	54	0	0	0	0
17	M	81	0	0	0	0
17	N	58	0	0	0	0
17	O	34	0	0	0	0
17	P	30	0	0	0	0
17	Q	29	0	0	0	0
17	R	27	0	0	0	0
17	S	18	0	0	0	0
17	T	43	0	0	0	0
17	U	55	0	0	0	0
17	V	50	0	0	0	0
17	W	62	0	0	0	0
17	X	41	0	0	0	0
17	Y	50	0	0	0	0
17	Z	49	0	0	0	0
17	a	78	0	0	0	0
17	b	56	0	0	0	0
All	All	51011	0	49406	302	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 3.

The worst 5 of 302 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)
3:C:9:PHE:H	4:D:15:GLN:HE22	1.33	0.77
6:T:91:GLU:HG2	6:T:111:ARG:HB3	1.67	0.76
3:Q:160:GLN:HA	3:Q:160:GLN:HE21	1.51	0.76

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:160:GLN:HE21	3:C:160:GLN:HA	1.51	0.75
6:F:91:GLU:HG2	6:F:111:ARG:HB3	1.67	0.74

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

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

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all 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%)	240 (97%)	6 (2%)	2 (1%)	16	44
1	O	248/250 (99%)	240 (97%)	6 (2%)	2 (1%)	16	44
2	B	242/258 (94%)	235 (97%)	5 (2%)	2 (1%)	16	44
2	P	242/258 (94%)	235 (97%)	5 (2%)	2 (1%)	16	44
3	C	239/254 (94%)	233 (98%)	3 (1%)	3 (1%)	9	31
3	Q	239/254 (94%)	233 (98%)	3 (1%)	3 (1%)	9	31
4	D	240/260 (92%)	235 (98%)	2 (1%)	3 (1%)	9	31
4	R	240/260 (92%)	235 (98%)	2 (1%)	3 (1%)	9	31
5	E	231/234 (99%)	224 (97%)	6 (3%)	1 (0%)	30	60
5	S	231/234 (99%)	224 (97%)	6 (3%)	1 (0%)	30	60
6	F	242/288 (84%)	233 (96%)	9 (4%)	0	100	100
6	T	242/288 (84%)	233 (96%)	9 (4%)	0	100	100
7	G	241/252 (96%)	236 (98%)	5 (2%)	0	100	100
7	U	241/252 (96%)	236 (98%)	5 (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%)	194 (96%)	7 (4%)	1 (0%)	24	55
9	W	202/205 (98%)	194 (96%)	7 (4%)	1 (0%)	24	55

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
10	J	196/198 (99%)	189 (96%)	6 (3%)	1 (0%)	24	55
10	X	196/198 (99%)	189 (96%)	6 (3%)	1 (0%)	24	55
11	K	210/212 (99%)	202 (96%)	7 (3%)	1 (0%)	24	55
11	Y	210/212 (99%)	202 (96%)	7 (3%)	1 (0%)	24	55
12	L	220/222 (99%)	215 (98%)	5 (2%)	0	100	100
12	Z	220/222 (99%)	215 (98%)	5 (2%)	0	100	100
13	M	231/233 (99%)	221 (96%)	10 (4%)	0	100	100
13	a	231/233 (99%)	221 (96%)	10 (4%)	0	100	100
14	N	194/196 (99%)	188 (97%)	6 (3%)	0	100	100
14	b	194/196 (99%)	188 (97%)	6 (3%)	0	100	100
15	c	1/8 (12%)	1 (100%)	0	0	100	100
15	d	1/8 (12%)	1 (100%)	0	0	100	100
All	All	6314/6604 (96%)	6120 (97%)	166 (3%)	28 (0%)	30	60

5 of 28 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	52	LEU
3	Q	52	LEU
1	A	2	THR
1	A	166	LYS
4	D	122	GLU

### 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%)	207 (99%)	2 (1%)	68	88
1	O	209/209 (100%)	207 (99%)	2 (1%)	68	88
2	B	203/216 (94%)	195 (96%)	8 (4%)	28	64
2	P	203/216 (94%)	195 (96%)	8 (4%)	28	64

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	C	213/226 (94%)	207 (97%)	6 (3%)	38	73
3	Q	213/226 (94%)	207 (97%)	6 (3%)	38	73
4	D	198/215 (92%)	190 (96%)	8 (4%)	28	63
4	R	198/215 (92%)	190 (96%)	8 (4%)	28	63
5	E	192/193 (100%)	186 (97%)	6 (3%)	35	70
5	S	192/193 (100%)	186 (97%)	6 (3%)	35	70
6	F	201/239 (84%)	194 (96%)	7 (4%)	32	67
6	T	201/239 (84%)	194 (96%)	7 (4%)	32	67
7	G	207/210 (99%)	202 (98%)	5 (2%)	43	77
7	U	207/210 (99%)	202 (98%)	5 (2%)	43	77
8	H	181/190 (95%)	179 (99%)	2 (1%)	65	87
8	V	181/190 (95%)	178 (98%)	3 (2%)	53	83
9	I	172/173 (99%)	170 (99%)	2 (1%)	63	87
9	W	172/173 (99%)	170 (99%)	2 (1%)	63	87
10	J	175/175 (100%)	173 (99%)	2 (1%)	65	87
10	X	175/175 (100%)	173 (99%)	2 (1%)	65	87
11	K	169/169 (100%)	163 (96%)	6 (4%)	31	66
11	Y	169/169 (100%)	163 (96%)	6 (4%)	31	66
12	L	185/185 (100%)	182 (98%)	3 (2%)	55	83
12	Z	185/185 (100%)	181 (98%)	4 (2%)	45	78
13	M	199/199 (100%)	192 (96%)	7 (4%)	32	67
13	a	199/199 (100%)	192 (96%)	7 (4%)	32	67
14	N	162/162 (100%)	161 (99%)	1 (1%)	78	92
14	b	162/162 (100%)	161 (99%)	1 (1%)	78	92
All	All	5332/5522 (97%)	5200 (98%)	132 (2%)	42	76

5 of 132 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
11	Y	35	ILE
11	Y	211	ILE
13	a	226	LYS
11	K	4	LEU
10	J	174	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 180 such sidechains are listed below:

Mol	Chain	Res	Type
5	S	109	HIS
8	V	141	HIS
5	S	151	ASN
6	T	224	HIS
10	X	37	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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	ACA	d	4	15	6,7,8	0.73	0	5,6,8	0.51	0
15	TY5	c	5	15	19,20,21	1.08	0	20,25,27	0.55	0
15	RE0	d	7	15	15,17,18	1.29	1 (6%)	19,25,27	1.99	5 (26%)
15	RE0	c	7	15	15,17,18	1.35	1 (6%)	19,25,27	2.00	5 (26%)
15	TY5	d	5	15	19,20,21	1.08	0	20,25,27	0.43	0
15	ACA	c	4	15	6,7,8	0.75	0	5,6,8	0.47	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	ACA	d	4	15	-	4/5/5/6	-
15	TY5	c	5	15	-	4/10/11/13	0/2/2/2

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
15	RE0	d	7	15	-	0/6/23/25	0/2/2/2
15	RE0	c	7	15	-	0/6/23/25	0/2/2/2
15	TY5	d	5	15	-	5/10/11/13	0/2/2/2
15	ACA	c	4	15	-	3/5/5/6	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
15	c	7	RE0	CG-CD2	3.61	1.54	1.51
15	d	7	RE0	CG-CD2	3.36	1.54	1.51

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
15	c	7	RE0	CG-CD2-CE2	-4.29	107.11	108.86
15	d	7	RE0	CG-CD2-CE2	-4.16	107.16	108.86
15	c	7	RE0	CD2-CE2-NE1	3.42	111.89	109.60
15	d	7	RE0	CD2-CE2-NE1	3.42	111.89	109.60
15	c	7	RE0	CG-CD1-NE1	3.35	110.43	108.43

There are no chirality outliers.

5 of 16 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
15	c	4	ACA	C-C2-C3-C4
15	d	4	ACA	O-C-C2-C3
15	c	5	TY5	CE2-CZ-OH-C49
15	d	5	TY5	CE1-CZ-OH-C49
15	d	5	TY5	CE2-CZ-OH-C49

There are no ring outliers.

2 monomers are involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
15	d	7	RE0	1	0
15	d	5	TY5	1	0

## 5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry

2 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
16	MES	K	301	-	12,12,12	1.31	2 (16%)	15,16,16	1.43	2 (13%)
16	MES	Y	301	-	12,12,12	1.39	2 (16%)	15,16,16	1.78	5 (33%)

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
16	MES	K	301	-	-	5/6/14/14	0/1/1/1
16	MES	Y	301	-	-	4/6/14/14	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
16	Y	301	MES	C8-S	2.98	1.81	1.77
16	K	301	MES	C8-S	2.87	1.81	1.77
16	K	301	MES	O2S-S	2.04	1.50	1.45
16	Y	301	MES	O2S-S	2.03	1.50	1.45

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
16	Y	301	MES	O2S-S-C8	-3.06	102.10	106.73
16	K	301	MES	O3S-S-O1S	2.88	118.62	111.40
16	Y	301	MES	O3S-S-O1S	2.88	118.60	111.40
16	K	301	MES	O2S-S-C8	-2.73	102.60	106.73
16	Y	301	MES	C6-C5-N4	2.53	113.96	110.12

There are no chirality outliers.

5 of 9 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
16	Y	301	MES	C7-C8-S-O2S
16	Y	301	MES	C7-C8-S-O3S
16	Y	301	MES	N4-C7-C8-S
16	K	301	MES	C8-C7-N4-C3
16	K	301	MES	C8-C7-N4-C5

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q < 0.9
1	A	250/250 (100%)	0.11	3 (1%) 76 68	58, 71, 92, 109	0
1	O	250/250 (100%)	0.14	6 (2%) 59 49	61, 77, 101, 118	0
2	B	244/258 (94%)	0.36	16 (6%) 24 18	58, 75, 111, 120	0
2	P	244/258 (94%)	0.44	16 (6%) 24 18	64, 79, 109, 124	0
3	C	241/254 (94%)	0.23	9 (3%) 45 36	56, 75, 112, 143	0
3	Q	241/254 (94%)	0.53	15 (6%) 26 20	69, 92, 139, 169	0
4	D	242/260 (93%)	0.29	9 (3%) 45 36	61, 76, 103, 120	0
4	R	242/260 (93%)	0.39	9 (3%) 45 36	65, 84, 114, 129	0
5	E	233/234 (99%)	0.21	5 (2%) 63 54	64, 79, 99, 112	0
5	S	233/234 (99%)	0.41	14 (6%) 27 21	65, 86, 112, 124	0
6	F	244/288 (84%)	0.24	9 (3%) 45 36	59, 74, 102, 125	0
6	T	244/288 (84%)	0.25	7 (2%) 53 43	61, 78, 112, 134	0
7	G	243/252 (96%)	0.20	5 (2%) 63 54	56, 73, 96, 130	0
7	U	243/252 (96%)	0.16	4 (1%) 70 61	60, 72, 91, 116	0
8	H	222/232 (95%)	0.02	1 (0%) 87 82	56, 67, 81, 98	0
8	V	222/232 (95%)	-0.00	1 (0%) 87 82	55, 66, 81, 105	0
9	I	204/205 (99%)	-0.12	1 (0%) 87 82	53, 63, 79, 83	0
9	W	204/205 (99%)	0.01	1 (0%) 87 82	59, 66, 82, 91	0
10	J	198/198 (100%)	0.13	8 (4%) 42 33	54, 66, 83, 116	0
10	X	198/198 (100%)	0.08	5 (2%) 58 48	59, 68, 83, 116	0
11	K	212/212 (100%)	0.25	11 (5%) 33 25	52, 66, 85, 91	0
11	Y	212/212 (100%)	0.24	11 (5%) 33 25	58, 68, 88, 96	0
12	L	222/222 (100%)	0.12	4 (1%) 67 58	55, 65, 89, 96	0
12	Z	222/222 (100%)	0.09	5 (2%) 61 51	56, 66, 88, 95	0

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
13	M	233/233 (100%)	-0.09	3 (1%) 75 66	53, 64, 77, 80	0
13	a	233/233 (100%)	-0.12	1 (0%) 88 84	53, 65, 76, 80	0
14	N	196/196 (100%)	-0.07	0 100 100	55, 62, 78, 86	0
14	b	196/196 (100%)	-0.10	3 (1%) 72 63	54, 62, 77, 85	0
15	c	1/8 (12%)	0.69	0 100 100	58, 58, 58, 58	0
15	d	1/8 (12%)	0.66	0 100 100	56, 56, 56, 56	0
All	All	6370/6604 (96%)	0.16	182 (2%) 53 43	52, 71, 104, 169	0

The worst 5 of 182 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	R	119	ALA	8.0
4	D	119	ALA	7.7
3	Q	50	LEU	7.2
11	Y	104	TYR	7.1
4	D	120	SER	6.9

## 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
15	ACA	d	4	8/9	0.49	0.21	61,63,64,64	0
15	ACA	c	4	8/9	0.59	0.17	63,64,65,65	0
15	TY5	d	5	19/20	0.81	0.12	58,60,61,61	0
15	RE0	d	7	16/17	0.84	0.10	56,57,57,58	0
15	TY5	c	5	19/20	0.85	0.11	60,62,63,63	0
15	RE0	c	7	16/17	0.86	0.10	56,57,58,58	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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
16	MES	Y	301	12/12	0.86	0.19	60,64,66,66	0
16	MES	K	301	12/12	0.93	0.14	61,62,65,65	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.