



# Full wwPDB X-ray Structure Validation Report ⓘ

May 15, 2020 – 08:08 pm BST

PDB ID : 5L5S  
Title : Yeast 20S proteasome with human beta5i (1-138; V31M) and human beta6 (97-111; 118-133) in complex with PR-924  
Authors : Groll, M.; Huber, E.M.  
Deposited on : 2016-05-28  
Resolution : 2.60 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](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.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.11  
buster-report : 1.1.7 (2018)  
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) : 2.11

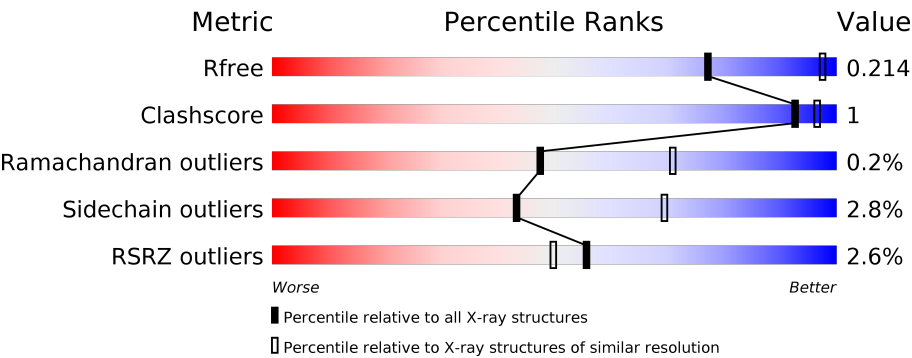
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.60 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	3163 (2.60-2.60)
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)
RSRZ outliers	127900	3104 (2.60-2.60)

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 on 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	<div><div>2%</div><div><div></div><div>98%</div><div></div></div><div></div></div>
1	O	250	<div><div>4%</div><div><div></div><div>98%</div><div></div></div><div></div></div>
2	B	258	<div><div>3%</div><div><div></div><div>90%</div><div></div></div><div><div></div><div>5%</div></div></div>
2	P	258	<div><div>3%</div><div><div></div><div>90%</div><div></div></div><div><div></div><div>5%</div><div>5%</div></div></div>
3	C	254	<div><div>7%</div><div><div></div><div>87%</div><div></div></div><div><div></div><div>7%</div><div>6%</div></div></div>
3	Q	254	<div><div>9%</div><div><div></div><div>87%</div><div></div></div><div><div></div><div>6%</div><div>6%</div></div></div>

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Mol	Chain	Length	Quality of chain
4	D	260	
4	R	260	
5	E	234	
5	S	234	
6	F	288	
6	T	288	
7	G	252	
7	U	252	
8	H	232	
8	V	232	
9	I	205	
9	W	205	
10	J	198	
10	X	198	
11	K	211	
11	Y	211	
12	L	222	
12	Z	222	
13	M	246	
13	a	246	
14	N	196	
14	b	196	

## 2 Entry composition

There are 18 unique types of molecules in this entry. The entry contains 50028 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	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-8,Proteasome subunit beta type-5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
11	K	211	Total	C	N	O	S	0	0	0
			1641	1035	282	311	13			
11	Y	211	Total	C	N	O	S	0	0	0
			1641	1035	282	311	13			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
K	31	MET	VAL	conflict	UNP P28062
Y	31	MET	VAL	conflict	UNP P28062

- Molecule 12 is a protein called Proteasome subunit beta type-6,Proteasome subunit beta type-1,Proteasome subunit beta type-6,Proteasome subunit beta type-1,Proteasome subunit beta type-6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
12	L	222	Total	C	N	O	S	0	0	0
			1764	1119	305	336	4			
12	Z	222	Total	C	N	O	S	0	0	0
			1764	1119	305	336	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	1	0
			1832	1159	315	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			

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

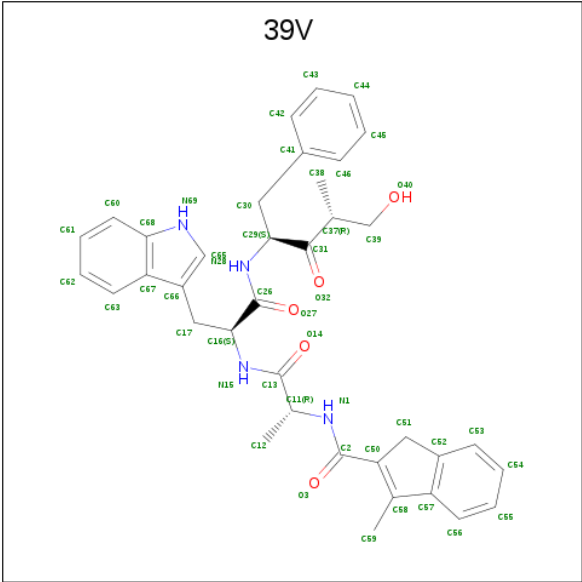
- Molecule 15 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

- Molecule 16 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
16	G	1	Total	Cl	0	0
			1	1		
16	U	1	Total	Cl	0	0
			1	1		

- Molecule 17 is N-[(3-methyl-1H-inden-2-yl)carbonyl]-D-alanyl-N-[(2S,4R)-5-hydroxy-4-methyl-3-oxo-1-phenylpentan-2-yl]-L-tryptophanamide (three-letter code: 39V) (formula: C<sub>37</sub>H<sub>40</sub>N<sub>4</sub>O<sub>5</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
17	K	1	Total	C	N	O	0	0
			46	37	4	5		
17	Y	1	Total	C	N	O	0	0
			46	37	4	5		

- Molecule 18 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
18	A	30	Total	O	0	0
			30	30		
18	B	15	Total	O	0	0
			15	15		
18	C	13	Total	O	0	0
			13	13		
18	D	11	Total	O	0	0
			11	11		
18	E	13	Total	O	0	0
			13	13		
18	F	19	Total	O	0	0
			19	19		
18	G	26	Total	O	0	0
			26	26		
18	H	29	Total	O	0	0
			29	29		
18	I	17	Total	O	0	0
			17	17		
18	J	21	Total	O	0	0
			21	21		

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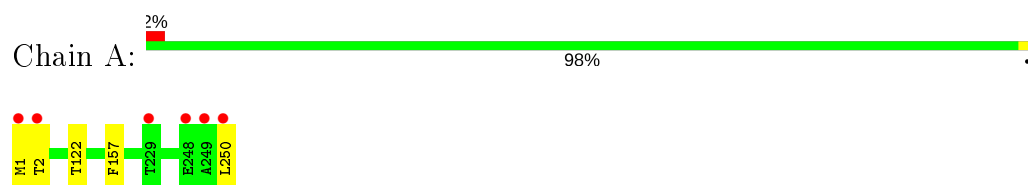
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
18	K	13	Total 13	O 13	0	0
18	L	20	Total 20	O 20	0	0
18	M	28	Total 28	O 28	0	0
18	N	25	Total 25	O 25	0	0
18	O	25	Total 25	O 25	0	0
18	P	18	Total 18	O 18	0	0
18	Q	12	Total 12	O 12	0	0
18	R	13	Total 13	O 13	0	0
18	S	9	Total 9	O 9	0	0
18	T	19	Total 19	O 19	0	0
18	U	27	Total 27	O 27	0	0
18	V	22	Total 22	O 22	0	0
18	W	19	Total 19	O 19	0	0
18	X	21	Total 21	O 21	0	0
18	Y	12	Total 12	O 12	0	0
18	Z	18	Total 18	O 18	0	0
18	a	29	Total 29	O 29	0	0
18	b	19	Total 19	O 19	0	0

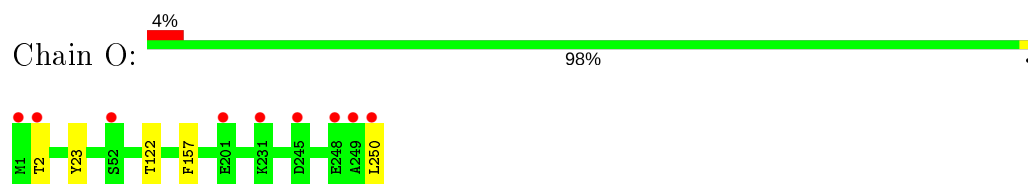
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

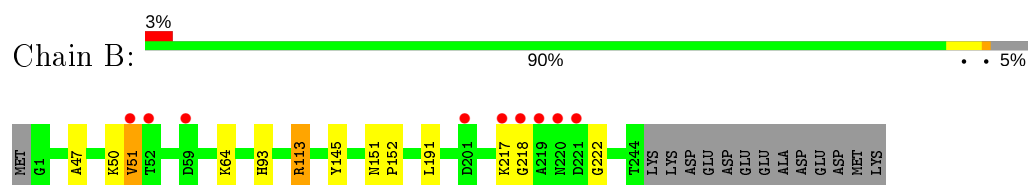
- Molecule 1: Proteasome subunit alpha type-2



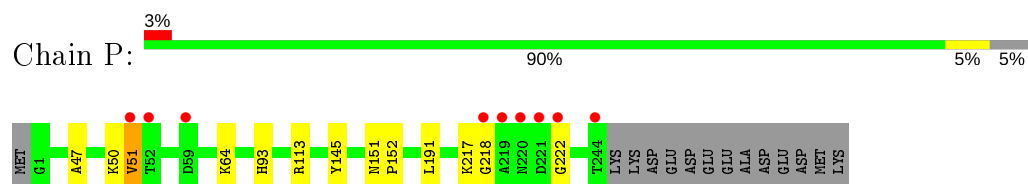
- Molecule 1: Proteasome subunit alpha type-2



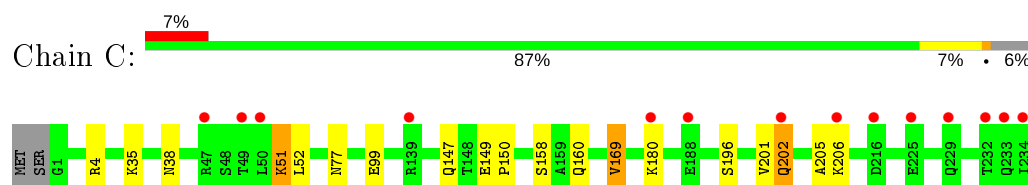
- Molecule 2: Proteasome subunit alpha type-3



- Molecule 2: Proteasome subunit alpha type-3

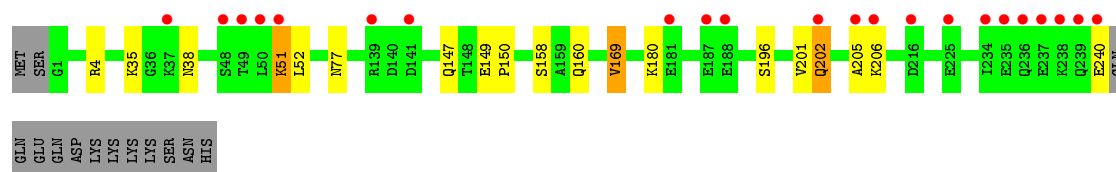
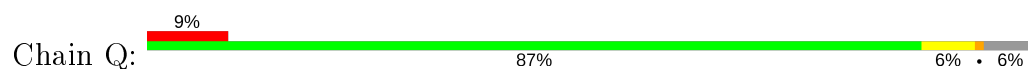


- Molecule 3: Proteasome subunit alpha type-4

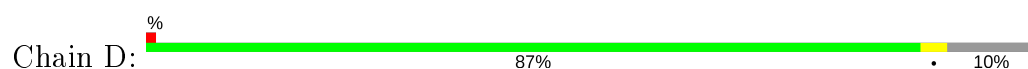




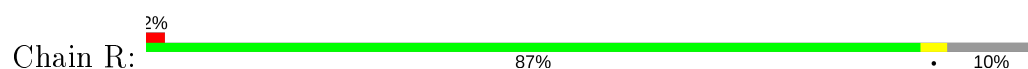
• Molecule 3: Proteasome subunit alpha type-4



• Molecule 4: Proteasome subunit alpha type-5



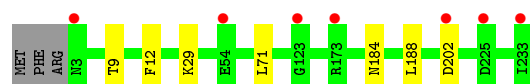
• Molecule 4: Proteasome subunit alpha type-5



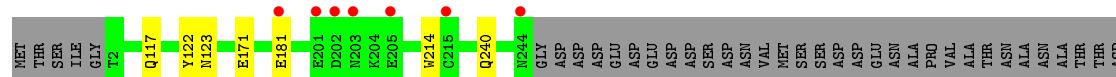
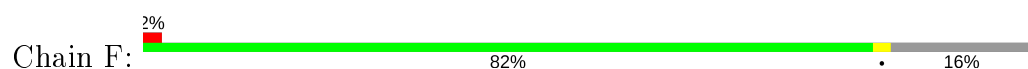
• Molecule 5: Proteasome subunit alpha type-6



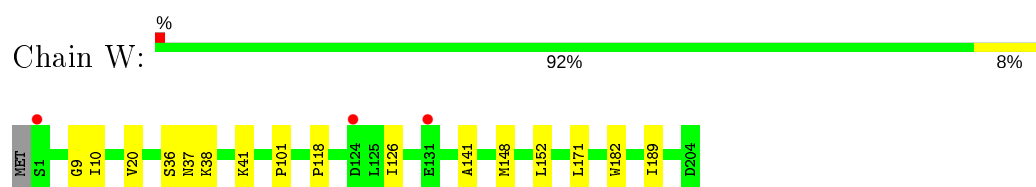
• Molecule 5: Proteasome subunit alpha type-6



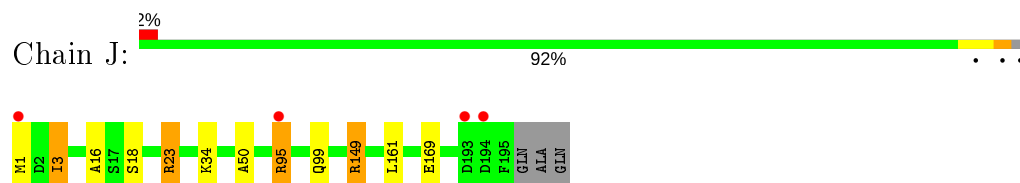
• Molecule 6: Probable proteasome subunit alpha type-7



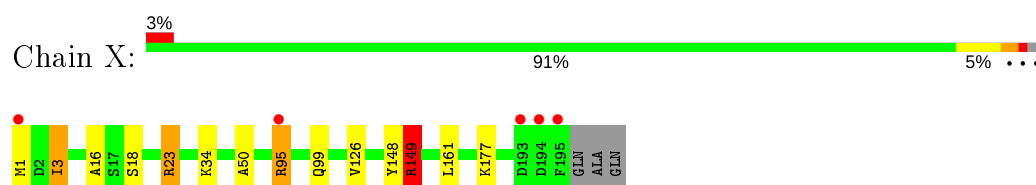




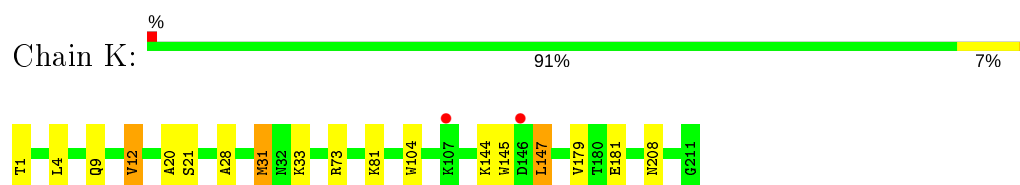
- Molecule 10: Proteasome subunit beta type-4



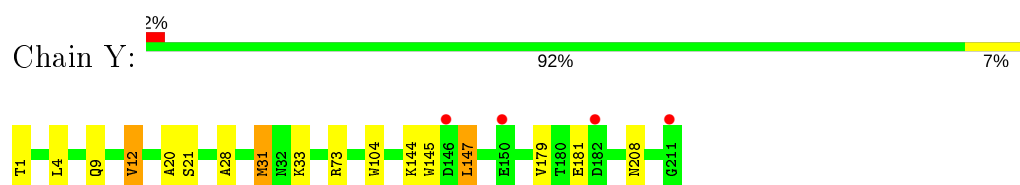
- Molecule 10: Proteasome subunit beta type-4



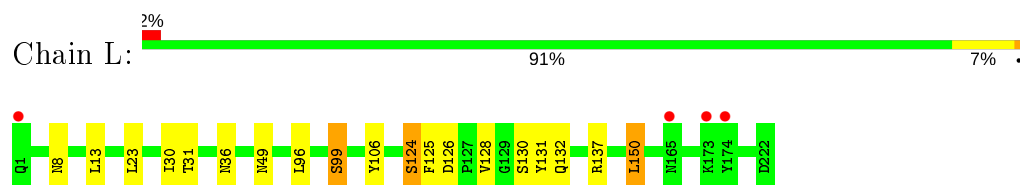
- Molecule 11: Proteasome subunit beta type-8, Proteasome subunit beta type-5



- Molecule 11: Proteasome subunit beta type-8, Proteasome subunit beta type-5



- Molecule 12: Proteasome subunit beta type-6, Proteasome subunit beta type-1, Proteasome subunit beta type-6, Proteasome subunit beta type-1, Proteasome subunit beta type-6



- Molecule 12: Proteasome subunit beta type-6, Proteasome subunit beta type-1, Proteasome subunit beta type-6, Proteasome subunit beta type-1, Proteasome subunit beta type-6

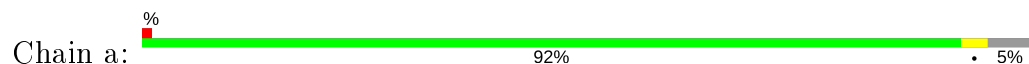




- Molecule 13: Proteasome subunit beta type-7



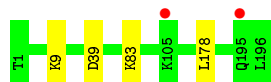
- Molecule 13: Proteasome subunit beta type-7



- Molecule 14: Proteasome subunit beta type-1



- Molecule 14: Proteasome subunit beta type-1



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	135.47Å 299.13Å 145.37Å 90.00° 112.55° 90.00°	Depositor
Resolution (Å)	15.00 – 2.60 14.99 – 2.60	Depositor EDS
% Data completeness (in resolution range)	98.0 (15.00-2.60) 98.1 (14.99-2.60)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.98 (at 2.61Å)	Xtriage
Refinement program	REFMAC 5.7.0032	Depositor
R, $R_{free}$	0.190 , 0.211 0.194 , 0.214	Depositor DCC
$R_{free}$ test set	15908 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	50.9	Xtriage
Anisotropy	0.084	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 36.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	50028	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	59.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.30% 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 ⓘ

### 5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: MG, 39V, 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	0.27	0/1952	0.46	0/2642
1	O	0.27	0/1952	0.46	0/2642
2	B	0.27	0/1934	0.48	0/2618
2	P	0.27	0/1934	0.48	0/2618
3	C	0.27	0/1910	0.50	0/2586
3	Q	0.27	0/1910	0.49	0/2586
4	D	0.27	0/1837	0.46	0/2475
4	R	0.26	0/1837	0.46	0/2475
5	E	0.27	0/1800	0.46	0/2433
5	S	0.27	0/1800	0.46	0/2433
6	F	0.27	0/1932	0.44	0/2609
6	T	0.27	0/1932	0.44	0/2609
7	G	0.27	0/1945	0.46	0/2634
7	U	0.27	0/1945	0.46	0/2634
8	H	0.26	0/1750	0.56	4/2373 (0.2%)
8	V	0.26	0/1750	0.61	1/2373 (0.0%)
9	I	0.27	0/1611	0.50	0/2174
9	W	0.27	0/1611	0.50	0/2174
10	J	0.27	0/1589	0.96	6/2142 (0.3%)
10	X	0.27	0/1589	0.95	6/2142 (0.3%)
11	K	0.45	2/1678 (0.1%)	0.74	5/2263 (0.2%)
11	Y	0.45	2/1678 (0.1%)	0.76	6/2263 (0.3%)
12	L	0.29	0/1802	0.50	0/2430
12	Z	0.30	0/1802	0.51	1/2430 (0.0%)
13	M	0.26	0/1866	0.52	0/2528
13	a	0.26	0/1855	0.52	0/2514
14	N	0.25	0/1541	0.48	0/2087
14	b	0.25	0/1541	0.48	0/2087
All	All	0.28	4/50283 (0.0%)	0.55	29/67974 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if



the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
10	J	0	2
10	X	0	2
All	All	0	4

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
11	Y	73	ARG	CZ-NH1	-10.78	1.19	1.33
11	K	73	ARG	CZ-NH2	-10.55	1.19	1.33
11	K	73	ARG	CZ-NH1	-9.88	1.20	1.33
11	Y	73	ARG	CZ-NH2	-9.72	1.20	1.33

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
10	J	95	ARG	NE-CZ-NH2	-20.61	110.00	120.30
10	X	149	ARG	NE-CZ-NH2	-20.41	110.10	120.30
10	J	149	ARG	NE-CZ-NH1	-19.82	110.39	120.30
10	X	95	ARG	NE-CZ-NH1	-19.21	110.70	120.30
11	Y	73	ARG	NE-CZ-NH2	18.76	129.68	120.30
11	K	73	ARG	NE-CZ-NH1	17.58	129.09	120.30
8	V	113	ILE	CG1-CB-CG2	-17.00	74.00	111.40
10	J	149	ARG	NE-CZ-NH2	16.35	128.48	120.30
10	X	95	ARG	NE-CZ-NH2	16.18	128.39	120.30
10	X	149	ARG	NE-CZ-NH1	15.09	127.85	120.30
10	J	95	ARG	NE-CZ-NH1	14.69	127.64	120.30
11	Y	73	ARG	NH1-CZ-NH2	-13.32	104.75	119.40
11	K	73	ARG	NH1-CZ-NH2	-13.03	105.07	119.40
11	K	73	ARG	NE-CZ-NH2	10.54	125.57	120.30
11	Y	73	ARG	NE-CZ-NH1	10.46	125.53	120.30
10	J	95	ARG	CD-NE-CZ	10.10	137.74	123.60
10	X	149	ARG	CD-NE-CZ	9.79	137.31	123.60
10	J	149	ARG	CD-NE-CZ	9.42	136.79	123.60
10	X	95	ARG	CD-NE-CZ	8.99	136.18	123.60
8	H	113	ILE	CG1-CB-CG2	-7.85	94.14	111.40
8	H	113	ILE	CB-CG1-CD1	7.45	134.77	113.90
11	Y	1	THR	N-CA-C	7.26	130.62	111.00
11	K	1	THR	N-CA-C	6.69	129.05	111.00
11	Y	1	THR	CA-CB-CG2	6.28	121.19	112.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	H	113	ILE	CB-CA-C	-5.63	100.33	111.60
12	Z	126	ASP	CB-CG-OD1	5.32	123.09	118.30
11	K	1	THR	CB-CA-C	-5.20	97.56	111.60
11	Y	1	THR	CB-CA-C	-5.15	97.68	111.60
8	H	113	ILE	CA-CB-CG1	5.14	120.77	111.00

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
10	J	149	ARG	Sidechain
10	J	95	ARG	Sidechain
10	X	149	ARG	Sidechain
10	X	95	ARG	Sidechain

## 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	1	0
1	O	1915	0	1929	1	0
2	B	1904	0	1904	6	0
2	P	1904	0	1904	5	0
3	C	1881	0	1895	7	0
3	Q	1881	0	1895	6	0
4	D	1813	0	1797	2	0
4	R	1813	0	1797	1	0
5	E	1773	0	1775	0	0
5	S	1773	0	1775	1	0
6	F	1892	0	1883	1	0
6	T	1892	0	1883	1	0
7	G	1907	0	1901	3	0
7	U	1907	0	1901	4	0
8	H	1719	0	1719	11	0
8	V	1719	0	1719	9	0
9	I	1581	0	1574	8	0
9	W	1581	0	1574	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
10	J	1561	0	1569	5	0
10	X	1561	0	1569	7	0
11	K	1641	0	1578	14	0
11	Y	1641	0	1578	12	0
12	L	1764	0	1716	8	0
12	Z	1764	0	1716	8	0
13	M	1832	0	1845	6	0
13	a	1824	0	1832	0	0
14	N	1512	0	1481	4	0
14	b	1512	0	1481	0	0
15	G	2	0	0	0	0
15	I	2	0	0	0	0
15	J	1	0	0	0	0
15	K	1	0	0	0	0
15	L	1	0	0	0	0
15	N	1	0	0	0	0
15	Z	1	0	0	0	0
16	G	1	0	0	0	0
16	U	1	0	0	0	0
17	K	46	0	39	11	0
17	Y	46	0	39	8	0
18	A	30	0	0	0	0
18	B	15	0	0	2	0
18	C	13	0	0	0	0
18	D	11	0	0	0	0
18	E	13	0	0	0	0
18	F	19	0	0	0	0
18	G	26	0	0	0	0
18	H	29	0	0	0	0
18	I	17	0	0	0	0
18	J	21	0	0	0	0
18	K	13	0	0	0	0
18	L	20	0	0	0	0
18	M	28	0	0	1	0
18	N	25	0	0	0	0
18	O	25	0	0	0	0
18	P	18	0	0	1	0
18	Q	12	0	0	0	0
18	R	13	0	0	0	0
18	S	9	0	0	0	0
18	T	19	0	0	0	0
18	U	27	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
18	V	22	0	0	0	0
18	W	19	0	0	0	0
18	X	21	0	0	0	0
18	Y	12	0	0	0	0
18	Z	18	0	0	0	0
18	a	29	0	0	0	0
18	b	19	0	0	0	0
All	All	50028	0	49197	134	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 1.

All (134) 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:31:MET:HE1	17:K:301:39V:H7	1.57	0.84
11:K:31:MET:CE	17:K:301:39V:H7	2.15	0.77
17:K:301:39V:H1	17:K:301:39V:H4	1.52	0.74
12:Z:124:SER:OG	12:Z:137:ARG:HG2	1.90	0.71
11:Y:31:MET:SD	17:Y:301:39V:H32	2.31	0.70
12:L:124:SER:OG	12:L:137:ARG:HG2	1.91	0.70
8:V:80:LEU:HD12	8:V:113:ILE:HD12	1.71	0.70
8:H:113:ILE:HD13	8:H:119:THR:HG22	1.74	0.69
11:K:31:MET:SD	17:K:301:39V:H32	2.35	0.66
14:N:152:VAL:HA	14:N:175:MET:HE1	1.83	0.60
11:Y:31:MET:HE1	17:Y:301:39V:H7	1.84	0.59
12:L:31:THR:HG23	12:L:36:ASN:HD21	1.68	0.59
17:K:301:39V:H4	17:K:301:39V:N1	2.15	0.58
12:Z:31:THR:HG23	12:Z:36:ASN:HD21	1.68	0.58
11:Y:31:MET:CE	17:Y:301:39V:H7	2.36	0.55
12:Z:126:ASP:OD2	12:Z:130:SER:OG	2.25	0.55
2:B:93:HIS:HB3	18:B:301:HOH:O	2.08	0.54
8:H:80:LEU:HD12	8:H:113:ILE:HD11	1.91	0.53
17:K:301:39V:H9	12:L:124:SER:HB3	1.90	0.53
11:K:20:ALA:HB3	11:K:28:ALA:HB3	1.91	0.53
17:K:301:39V:C59	17:K:301:39V:H1	2.19	0.53
11:K:208:ASN:O	9:W:38:LYS:NZ	2.42	0.53
2:P:93:HIS:HB3	18:P:301:HOH:O	2.09	0.52
9:I:38:LYS:NZ	11:Y:208:ASN:O	2.42	0.52
10:X:1:MET:HG2	10:X:34:LYS:HE3	1.91	0.52
11:Y:20:ALA:HB3	11:Y:28:ALA:HB3	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
14:N:83:LYS:HG3	14:N:119:VAL:CG2	2.40	0.52
8:H:3:ILE:HG21	8:H:44:ALA:CB	2.40	0.51
10:J:1:MET:HG2	10:J:34:LYS:HE3	1.91	0.51
11:Y:33:LYS:HE2	17:Y:301:39V:C41	2.40	0.51
3:C:201:VAL:O	3:C:202:GLN:CB	2.59	0.51
8:H:113:ILE:HD13	8:H:119:THR:CG2	2.40	0.51
8:V:3:ILE:HG21	8:V:44:ALA:CB	2.41	0.50
7:U:23:PHE:O	7:U:26:THR:HB	2.11	0.50
3:Q:201:VAL:O	3:Q:202:GLN:CB	2.59	0.50
7:G:23:PHE:O	7:G:26:THR:HB	2.12	0.49
8:H:50:ALA:CB	9:I:126:ILE:HG23	2.43	0.49
14:N:176:VAL:HG12	14:N:178:LEU:HD13	1.95	0.49
10:J:16:ALA:HB2	10:J:161:LEU:HD21	1.95	0.49
3:C:201:VAL:O	3:C:202:GLN:HB3	2.14	0.48
11:K:31:MET:CE	17:K:301:39V:C56	2.88	0.48
10:X:16:ALA:HB2	10:X:161:LEU:HD21	1.95	0.48
8:V:80:LEU:CD1	8:V:113:ILE:HD12	2.42	0.48
11:K:31:MET:HE3	17:K:301:39V:C56	2.44	0.47
3:Q:201:VAL:O	3:Q:202:GLN:HB3	2.14	0.47
8:V:50:ALA:CB	9:W:126:ILE:HG23	2.45	0.47
8:V:112:SER:HB3	8:V:125:LEU:HD13	1.98	0.46
11:K:21:SER:O	17:K:301:39V:H13	2.16	0.46
13:M:96:LEU:O	13:M:100:MET:HG2	2.16	0.46
10:J:3:ILE:HG23	10:J:18:SER:HB3	1.98	0.46
12:L:8:ASN:HA	12:L:30:ILE:O	2.16	0.46
2:P:50:LYS:O	2:P:51:VAL:C	2.54	0.46
11:Y:33:LYS:HE2	17:Y:301:39V:C42	2.46	0.46
13:M:2:GLN:NE2	18:M:301:HOH:O	2.49	0.46
8:V:3:ILE:HG21	8:V:44:ALA:HB3	1.98	0.46
10:X:148:TYR:O	10:X:149:ARG:HD3	2.15	0.45
2:B:50:LYS:O	2:B:51:VAL:C	2.55	0.45
11:K:104:TRP:CE2	11:K:181:GLU:HB3	2.51	0.45
9:W:20:VAL:HG23	9:W:189:ILE:HB	1.98	0.45
9:W:9:GLY:HA3	9:W:41:LYS:HE2	1.98	0.45
11:Y:104:TRP:CE2	11:Y:181:GLU:HB3	2.51	0.45
9:I:9:GLY:HA3	9:I:41:LYS:HE2	1.98	0.45
8:H:112:SER:HB3	8:H:125:LEU:HD13	1.99	0.45
5:S:12:PHE:H	6:T:19:GLN:HE22	1.65	0.45
10:X:3:ILE:HG23	10:X:18:SER:HB3	1.99	0.45
11:Y:144:LYS:HB2	11:Y:147:LEU:HD13	1.99	0.45
8:H:3:ILE:HG21	8:H:44:ALA:HB3	1.98	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
12:L:96:LEU:O	12:L:99:SER:OG	2.36	0.44
12:Z:96:LEU:O	12:Z:99:SER:OG	2.35	0.44
9:I:20:VAL:HG13	9:I:118:PRO:HB3	1.99	0.44
9:I:20:VAL:HG23	9:I:189:ILE:HB	1.99	0.44
12:Z:8:ASN:HA	12:Z:30:ILE:O	2.17	0.44
11:K:144:LYS:HB2	11:K:147:LEU:HD13	1.99	0.44
8:V:104:ASP:HB2	8:V:105:PRO:HD2	1.99	0.44
9:W:20:VAL:HG13	9:W:118:PRO:HB3	1.98	0.44
13:M:127:LEU:HG	13:M:142:LEU:HD12	2.00	0.44
3:C:51:LYS:O	3:C:52:LEU:HB2	2.18	0.43
8:H:104:ASP:HB2	8:H:105:PRO:HD2	1.99	0.43
11:K:33:LYS:HE2	17:K:301:39V:C42	2.48	0.43
2:P:151:ASN:HB2	2:P:152:PRO:CD	2.48	0.43
17:Y:301:39V:N15	17:Y:301:39V:C65	2.80	0.43
11:Y:21:SER:O	17:Y:301:39V:H13	2.19	0.43
2:B:151:ASN:HB2	2:B:152:PRO:CD	2.48	0.43
14:N:35:THR:HG21	14:N:45:ARG:HE	1.84	0.43
9:W:148:MET:HE3	9:W:152:LEU:HD11	2.01	0.43
9:W:36:SER:HB2	10:X:126:VAL:HG11	1.99	0.43
3:Q:51:LYS:O	3:Q:52:LEU:HB2	2.18	0.43
11:Y:9:GLN:HB2	11:Y:145:TRP:O	2.19	0.43
1:A:1:MET:HG3	6:F:122:TYR:CZ	2.53	0.43
3:C:169:VAL:HG23	3:C:196:SER:HB2	2.00	0.42
17:Y:301:39V:H4	17:Y:301:39V:N1	2.34	0.42
9:I:10:ILE:HG21	9:I:141:ALA:HB3	2.01	0.42
11:K:9:GLN:HB2	11:K:145:TRP:O	2.18	0.42
11:K:12:VAL:HG13	11:K:179:VAL:HB	2.00	0.42
13:M:187:ARG:NH1	8:V:139:GLU:OE1	2.45	0.42
11:Y:12:VAL:HG13	11:Y:179:VAL:HB	2.01	0.42
3:C:149:GLU:HB2	3:C:150:PRO:HD2	2.02	0.42
9:W:101:PRO:HB3	9:W:126:ILE:HD12	2.01	0.42
9:W:10:ILE:HG21	9:W:141:ALA:HB3	2.01	0.42
2:B:145:TYR:OH	2:B:217:LYS:N	2.53	0.42
9:I:148:MET:HE3	9:I:152:LEU:HD11	2.02	0.42
13:M:165:ILE:HB	13:M:166:PRO:HD3	2.02	0.42
7:G:78:ILE:N	7:G:79:PRO:CD	2.83	0.42
10:J:169:GLU:O	10:X:177:LYS:NZ	2.53	0.42
12:Z:124:SER:HB2	12:Z:134:GLU:OE2	2.20	0.42
1:O:23:TYR:CD1	7:U:12:PRO:HA	2.55	0.42
3:Q:169:VAL:HG23	3:Q:196:SER:HB2	2.00	0.42
4:R:160:ASN:HB3	4:R:179:TRP:CE2	2.55	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:P:145:TYR:OH	2:P:217:LYS:N	2.53	0.41
3:Q:149:GLU:HB2	3:Q:150:PRO:HD2	2.02	0.41
4:D:160:ASN:HB3	4:D:179:TRP:CE2	2.55	0.41
7:G:149:ASP:HB2	7:G:150:PRO:CD	2.50	0.41
3:C:99:GLU:HG3	11:K:81:LYS:CD	2.49	0.41
7:U:149:ASP:HB2	7:U:150:PRO:CD	2.50	0.41
9:I:101:PRO:HB3	9:I:126:ILE:HD12	2.01	0.41
3:Q:35:LYS:HG2	3:Q:158:SER:O	2.21	0.41
8:V:22:GLN:HG2	8:V:27:ALA:HB2	2.01	0.41
12:Z:125:PHE:CD2	12:Z:131:TYR:HB3	2.55	0.41
2:B:113:ARG:NE	18:B:301:HOH:O	2.37	0.41
2:B:47:ALA:HB1	2:B:64:LYS:HD2	2.03	0.41
8:H:22:GLN:HG2	8:H:27:ALA:HB2	2.02	0.41
12:L:126:ASP:OD2	12:L:130:SER:OG	2.34	0.41
12:L:13:LEU:HD11	12:L:150:LEU:HD21	2.03	0.41
7:U:78:ILE:N	7:U:79:PRO:CD	2.83	0.41
10:X:23:ARG:NH2	10:X:50:ALA:HB1	2.36	0.41
13:M:17:ASP:OD1	13:M:18:ASN:N	2.53	0.41
12:L:125:PHE:CD2	12:L:131:TYR:HB3	2.56	0.41
4:D:91:HIS:HB3	4:D:99:ILE:CG2	2.51	0.41
10:J:23:ARG:NH2	10:J:50:ALA:HB1	2.36	0.41
2:P:47:ALA:HB1	2:P:64:LYS:HD2	2.03	0.41
8:H:3:ILE:HG21	8:H:44:ALA:HB1	2.03	0.41
8:H:35:HIS:HB3	8:H:56:THR:HG21	2.03	0.40
12:Z:132:GLN:HE21	12:Z:132:GLN:HB2	1.69	0.40
3:C:35:LYS:HG2	3:C:158:SER:O	2.21	0.40

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%)	239 (96%)	8 (3%)	1 (0%)	34	57
1	O	248/250 (99%)	239 (96%)	8 (3%)	1 (0%)	34	57
2	B	242/258 (94%)	234 (97%)	5 (2%)	3 (1%)	13	27
2	P	242/258 (94%)	234 (97%)	5 (2%)	3 (1%)	13	27
3	C	238/254 (94%)	233 (98%)	3 (1%)	2 (1%)	19	39
3	Q	238/254 (94%)	233 (98%)	3 (1%)	2 (1%)	19	39
4	D	231/260 (89%)	226 (98%)	5 (2%)	0	100	100
4	R	231/260 (89%)	226 (98%)	5 (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%)	239 (99%)	2 (1%)	0	100	100
6	T	241/288 (84%)	239 (99%)	2 (1%)	0	100	100
7	G	239/252 (95%)	237 (99%)	2 (1%)	0	100	100
7	U	239/252 (95%)	238 (100%)	1 (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%)	196 (97%)	6 (3%)	0	100	100
9	W	202/205 (98%)	195 (96%)	7 (4%)	0	100	100
10	J	193/198 (98%)	190 (98%)	3 (2%)	0	100	100
10	X	193/198 (98%)	190 (98%)	3 (2%)	0	100	100
11	K	209/211 (99%)	202 (97%)	7 (3%)	0	100	100
11	Y	209/211 (99%)	202 (97%)	7 (3%)	0	100	100
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	232/246 (94%)	223 (96%)	8 (3%)	1 (0%)	34	57
13	a	231/246 (94%)	222 (96%)	8 (4%)	1 (0%)	34	57
14	N	194/196 (99%)	187 (96%)	7 (4%)	0	100	100
14	b	194/196 (99%)	187 (96%)	7 (4%)	0	100	100
All	All	6283/6612 (95%)	6123 (98%)	146 (2%)	14 (0%)	47	71

All (14) Ramachandran outliers are listed below:



Mol	Chain	Res	Type
2	B	51	VAL
3	C	202	GLN
2	P	51	VAL
3	Q	202	GLN
1	A	2	THR
2	B	218	GLY
2	B	222	GLY
1	O	2	THR
2	P	218	GLY
2	P	222	GLY
3	C	205	ALA
13	M	83	ALA
3	Q	205	ALA
13	a	83	ALA

### 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%)	206 (99%)	3 (1%)	67	85
1	O	209/209 (100%)	206 (99%)	3 (1%)	67	85
2	B	203/216 (94%)	201 (99%)	2 (1%)	76	90
2	P	203/216 (94%)	201 (99%)	2 (1%)	76	90
3	C	212/226 (94%)	202 (95%)	10 (5%)	26	50
3	Q	212/226 (94%)	202 (95%)	10 (5%)	26	50
4	D	194/215 (90%)	187 (96%)	7 (4%)	35	61
4	R	194/215 (90%)	187 (96%)	7 (4%)	35	61
5	E	190/193 (98%)	184 (97%)	6 (3%)	39	65
5	S	190/193 (98%)	184 (97%)	6 (3%)	39	65
6	F	201/239 (84%)	195 (97%)	6 (3%)	41	67
6	T	201/239 (84%)	195 (97%)	6 (3%)	41	67
7	G	206/210 (98%)	201 (98%)	5 (2%)	49	74
7	U	206/210 (98%)	201 (98%)	5 (2%)	49	74

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
8	H	185/190 (97%)	178 (96%)	7 (4%)	33	59
8	V	185/190 (97%)	177 (96%)	8 (4%)	29	54
9	I	172/173 (99%)	169 (98%)	3 (2%)	60	81
9	W	172/173 (99%)	169 (98%)	3 (2%)	60	81
10	J	173/175 (99%)	170 (98%)	3 (2%)	60	81
10	X	173/175 (99%)	170 (98%)	3 (2%)	60	81
11	K	170/170 (100%)	166 (98%)	4 (2%)	49	74
11	Y	170/170 (100%)	166 (98%)	4 (2%)	49	74
12	L	186/186 (100%)	178 (96%)	8 (4%)	29	54
12	Z	186/186 (100%)	178 (96%)	8 (4%)	29	54
13	M	200/208 (96%)	194 (97%)	6 (3%)	41	67
13	a	199/208 (96%)	193 (97%)	6 (3%)	41	67
14	N	162/162 (100%)	158 (98%)	4 (2%)	47	73
14	b	162/162 (100%)	158 (98%)	4 (2%)	47	73
All	All	5325/5544 (96%)	5176 (97%)	149 (3%)	43	69

All (149) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	122	THR
1	A	157	PHE
1	A	250	LEU
2	B	113	ARG
2	B	191	LEU
3	C	4	ARG
3	C	38	ASN
3	C	51	LYS
3	C	77	ASN
3	C	147	GLN
3	C	160	GLN
3	C	169	VAL
3	C	180	LYS
3	C	206	LYS
3	C	240	GLU
4	D	99	ILE
4	D	125	LEU
4	D	176	LEU

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Mol	Chain	Res	Type
4	D	193	LEU
4	D	235	LEU
4	D	236	LYS
4	D	242	GLU
5	E	9	THR
5	E	29	LYS
5	E	71	LEU
5	E	184	ASN
5	E	188	LEU
5	E	202	ASP
6	F	117	GLN
6	F	123	ASN
6	F	171	GLU
6	F	181	GLU
6	F	214	TRP
6	F	240	GLN
7	G	83	ASN
7	G	115	LEU
7	G	122	ARG
7	G	125	MET
7	G	235	ARG
8	H	3	ILE
8	H	22	GLN
8	H	30	ASN
8	H	55	VAL
8	H	68	LEU
8	H	153	LYS
8	H	196	ARG
9	I	37	ASN
9	I	171	LEU
9	I	182	TRP
10	J	3	ILE
10	J	23	ARG
10	J	99	GLN
11	K	4	LEU
11	K	12	VAL
11	K	31	MET
11	K	147	LEU
12	L	23	LEU
12	L	49	ASN
12	L	99	SER
12	L	106	TYR

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Mol	Chain	Res	Type
12	L	124	SER
12	L	128	VAL
12	L	132	GLN
12	L	150	LEU
13	M	2	GLN
13	M	48	ASN
13	M	70	LEU
13	M	104	ARG
13	M	161	ARG
13	M	187	ARG
14	N	9	LYS
14	N	39	ASP
14	N	83	LYS
14	N	178	LEU
1	O	122	THR
1	O	157	PHE
1	O	250	LEU
2	P	113	ARG
2	P	191	LEU
3	Q	4	ARG
3	Q	38	ASN
3	Q	51	LYS
3	Q	77	ASN
3	Q	147	GLN
3	Q	160	GLN
3	Q	169	VAL
3	Q	180	LYS
3	Q	206	LYS
3	Q	240	GLU
4	R	99	ILE
4	R	125	LEU
4	R	176	LEU
4	R	193	LEU
4	R	235	LEU
4	R	236	LYS
4	R	242	GLU
5	S	9	THR
5	S	29	LYS
5	S	71	LEU
5	S	184	ASN
5	S	188	LEU
5	S	202	ASP

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Mol	Chain	Res	Type
6	T	117	GLN
6	T	123	ASN
6	T	171	GLU
6	T	181	GLU
6	T	214	TRP
6	T	240	GLN
7	U	83	ASN
7	U	115	LEU
7	U	122	ARG
7	U	125	MET
7	U	235	ARG
8	V	3	ILE
8	V	22	GLN
8	V	30	ASN
8	V	55	VAL
8	V	68	LEU
8	V	113	ILE
8	V	153	LYS
8	V	196	ARG
9	W	37	ASN
9	W	171	LEU
9	W	182	TRP
10	X	3	ILE
10	X	23	ARG
10	X	99	GLN
11	Y	4	LEU
11	Y	12	VAL
11	Y	31	MET
11	Y	147	LEU
12	Z	23	LEU
12	Z	49	ASN
12	Z	99	SER
12	Z	106	TYR
12	Z	124	SER
12	Z	128	VAL
12	Z	132	GLN
12	Z	150	LEU
13	a	2	GLN
13	a	48	ASN
13	a	70	LEU
13	a	104	ARG
13	a	161	ARG

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Mol	Chain	Res	Type
13	a	187	ARG
14	b	9	LYS
14	b	39	ASP
14	b	83	LYS
14	b	178	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (91) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	20	GLN
2	B	58	GLN
2	B	95	GLN
2	B	119	GLN
2	B	123	GLN
3	C	17	GLN
3	C	116	GLN
3	C	120	GLN
3	C	147	GLN
3	C	160	GLN
4	D	15	GLN
4	D	91	HIS
4	D	210	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	151	ASN
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
9	I	37	ASN
10	J	55	GLN

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Mol	Chain	Res	Type
11	K	175	ASN
12	L	3	ASN
12	L	49	ASN
12	L	70	ASN
12	L	109	ASN
12	L	132	GLN
12	L	158	ASN
13	M	48	ASN
13	M	102	GLN
13	M	179	ASN
13	M	194	ASN
13	M	213	GLN
14	N	38	HIS
14	N	161	GLN
2	P	20	GLN
2	P	58	GLN
2	P	119	GLN
2	P	123	GLN
3	Q	116	GLN
3	Q	120	GLN
3	Q	147	GLN
3	Q	160	GLN
4	R	91	HIS
4	R	225	ASN
5	S	68	HIS
5	S	92	ASN
5	S	99	ASN
5	S	116	GLN
5	S	118	ASN
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
7	U	83	ASN
7	U	114	ASN
7	U	117	GLN
7	U	121	GLN
7	U	166	GLN

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Mol	Chain	Res	Type
8	V	66	HIS
10	X	55	GLN
11	Y	175	ASN
12	Z	3	ASN
12	Z	49	ASN
12	Z	70	ASN
12	Z	109	ASN
12	Z	132	GLN
12	Z	158	ASN
13	a	48	ASN
13	a	102	GLN
13	a	179	ASN
13	a	194	ASN
13	a	213	GLN
14	b	38	HIS
14	b	161	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](#)

There are no non-standard protein/DNA/RNA residues in this entry.

### 5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

### 5.6 Ligand geometry [i](#)

Of 13 ligands modelled in this entry, 11 are monoatomic - leaving 2 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
17	39V	K	301	11	48,50,50	3.75	18 (37%)	56,70,70	1.56	10 (17%)
17	39V	Y	301	11	48,50,50	3.88	16 (33%)	56,70,70	1.61	10 (17%)

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
17	39V	K	301	11	-	12/41/54/54	0/5/5/5
17	39V	Y	301	11	-	10/41/54/54	0/5/5/5

All (34) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
17	K	301	39V	C2-C50	-12.20	1.32	1.49
17	Y	301	39V	C2-C50	-11.56	1.33	1.49
17	Y	301	39V	O32-C31	11.14	1.39	1.21
17	Y	301	39V	C51-C50	-11.04	1.36	1.51
17	K	301	39V	C51-C50	-10.44	1.37	1.51
17	K	301	39V	O32-C31	10.01	1.37	1.21
17	Y	301	39V	C51-C52	-8.42	1.37	1.50
17	K	301	39V	C51-C52	-8.03	1.37	1.50
17	K	301	39V	C57-C58	-6.82	1.31	1.44
17	Y	301	39V	C57-C58	-6.55	1.31	1.44
17	Y	301	39V	C57-C52	-6.10	1.31	1.39
17	K	301	39V	C60-C68	-5.69	1.32	1.41
17	Y	301	39V	C63-C67	-5.42	1.31	1.42
17	Y	301	39V	C60-C68	-5.32	1.32	1.41
17	Y	301	39V	C30-C41	-5.26	1.38	1.51
17	K	301	39V	C63-C67	-5.17	1.31	1.42
17	Y	301	39V	C56-C57	-4.79	1.32	1.39
17	K	301	39V	C30-C41	-4.78	1.39	1.51
17	Y	301	39V	C53-C52	-4.59	1.31	1.39
17	K	301	39V	C57-C52	-4.47	1.33	1.39
17	K	301	39V	C56-C57	-4.43	1.32	1.39
17	K	301	39V	C53-C52	-4.27	1.32	1.39
17	Y	301	39V	C67-C68	-4.19	1.31	1.42
17	K	301	39V	C67-C68	-4.16	1.31	1.42
17	K	301	39V	C11-C13	-2.66	1.45	1.52
17	K	301	39V	C65-N69	-2.43	1.31	1.36

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
17	Y	301	39V	C65-N69	-2.39	1.31	1.36
17	K	301	39V	C65-C66	-2.24	1.31	1.37
17	K	301	39V	C37-C31	2.24	1.59	1.52
17	Y	301	39V	C16-C26	-2.23	1.47	1.52
17	Y	301	39V	C50-C58	-2.21	1.32	1.36
17	K	301	39V	C68-N69	-2.19	1.31	1.38
17	Y	301	39V	C65-C66	-2.08	1.31	1.37
17	K	301	39V	C50-C58	-2.02	1.32	1.36

All (20) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
17	Y	301	39V	O32-C31-C37	-5.23	111.56	121.26
17	K	301	39V	O32-C31-C37	-5.06	111.87	121.26
17	Y	301	39V	C52-C51-C50	4.12	105.81	102.67
17	K	301	39V	C30-C29-N28	-3.78	102.82	110.79
17	Y	301	39V	C66-C17-C16	-3.15	107.27	113.45
17	Y	301	39V	C30-C29-N28	-3.05	104.36	110.79
17	Y	301	39V	C17-C66-C65	-3.01	124.25	127.97
17	Y	301	39V	C12-C11-N1	-2.92	104.90	110.38
17	K	301	39V	C63-C67-C68	2.83	121.92	118.17
17	Y	301	39V	C62-C61-C60	-2.61	116.78	120.44
17	K	301	39V	C66-C17-C16	-2.48	108.59	113.45
17	K	301	39V	C11-C13-N15	-2.47	110.99	116.75
17	K	301	39V	O14-C13-N15	2.34	127.26	122.93
17	K	301	39V	C52-C51-C50	2.33	104.44	102.67
17	K	301	39V	C12-C11-C13	-2.28	105.80	110.14
17	K	301	39V	C12-C11-N1	-2.25	106.15	110.38
17	Y	301	39V	C12-C11-C13	-2.18	105.99	110.14
17	K	301	39V	C61-C62-C63	-2.16	117.42	120.44
17	Y	301	39V	C17-C16-N15	-2.10	106.36	110.79
17	Y	301	39V	O27-C26-N28	2.09	126.81	122.93

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
17	Y	301	39V	O32-C31-C37-C38
17	K	301	39V	O32-C31-C37-C38
17	K	301	39V	C29-C30-C41-C42
17	K	301	39V	C29-C30-C41-C46
17	Y	301	39V	C29-C30-C41-C42

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Mol	Chain	Res	Type	Atoms
17	Y	301	39V	C29-C30-C41-C46
17	Y	301	39V	C29-C31-C37-C38
17	K	301	39V	C29-C31-C37-C38
17	Y	301	39V	N15-C16-C26-O27
17	Y	301	39V	N15-C16-C26-N28
17	K	301	39V	N1-C11-C13-N15
17	K	301	39V	N28-C29-C30-C41
17	Y	301	39V	N1-C11-C13-N15
17	K	301	39V	N1-C11-C13-O14
17	Y	301	39V	N1-C11-C13-O14
17	K	301	39V	O3-C2-C50-C58
17	K	301	39V	N1-C2-C50-C51
17	Y	301	39V	C30-C29-C31-O32
17	K	301	39V	C30-C29-C31-O32
17	Y	301	39V	N28-C29-C31-C37
17	K	301	39V	N28-C29-C31-C37
17	K	301	39V	N15-C16-C26-O27

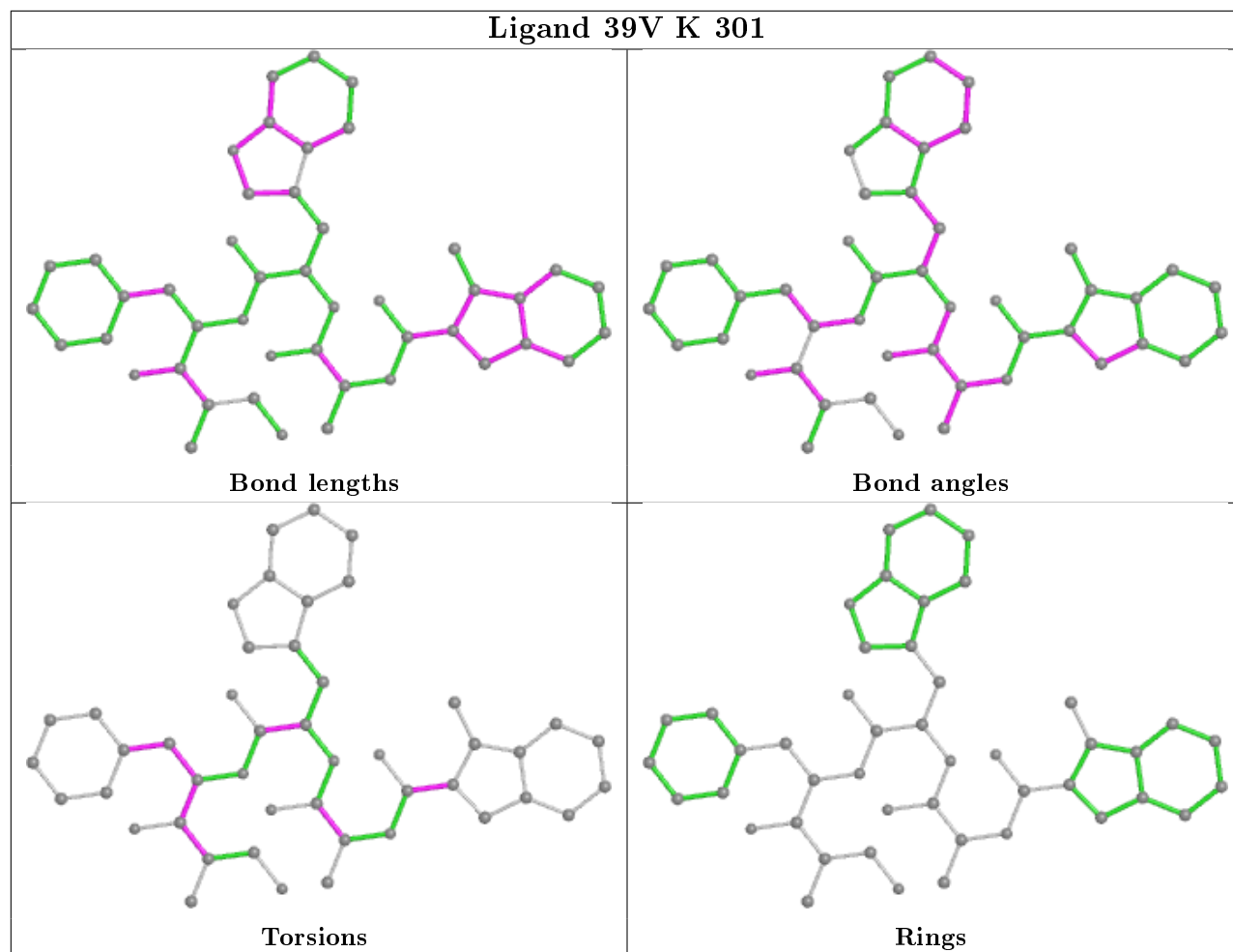
There are no ring outliers.

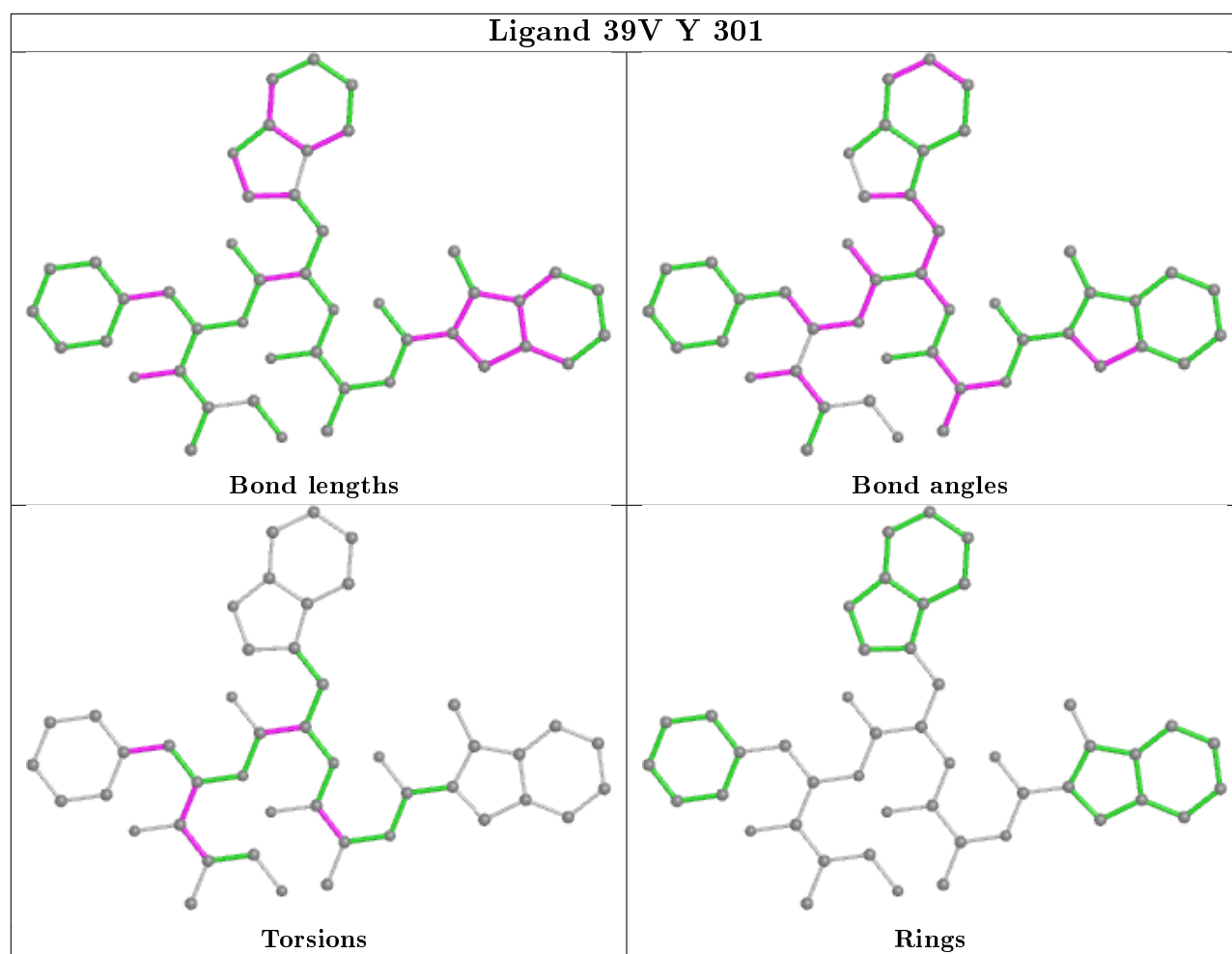
2 monomers are involved in 19 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
17	K	301	39V	11	0
17	Y	301	39V	8	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

## Ligand 39V K 301





## 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, 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%)	-0.34	6 (2%) 59 53	30, 49, 85, 122	0
1	O	250/250 (100%)	-0.33	9 (3%) 42 35	35, 53, 96, 130	0
2	B	244/258 (94%)	-0.20	9 (3%) 41 34	36, 55, 99, 153	0
2	P	244/258 (94%)	-0.21	9 (3%) 41 34	35, 55, 102, 153	0
3	C	240/254 (94%)	0.02	18 (7%) 14 10	34, 62, 128, 169	0
3	Q	240/254 (94%)	0.16	22 (9%) 9 6	39, 70, 149, 190	0
4	D	235/260 (90%)	-0.26	2 (0%) 84 82	39, 58, 90, 129	0
4	R	235/260 (90%)	-0.15	6 (2%) 56 50	50, 67, 107, 140	0
5	E	231/234 (98%)	-0.25	7 (3%) 50 43	40, 58, 94, 133	0
5	S	231/234 (98%)	-0.21	7 (3%) 50 43	41, 60, 97, 128	0
6	F	243/288 (84%)	-0.39	7 (2%) 51 45	33, 52, 102, 130	0
6	T	243/288 (84%)	-0.29	9 (3%) 41 34	32, 57, 109, 144	0
7	G	241/252 (95%)	-0.40	6 (2%) 57 51	32, 50, 87, 148	0
7	U	241/252 (95%)	-0.42	3 (1%) 79 76	33, 48, 85, 122	0
8	H	226/232 (97%)	-0.34	5 (2%) 62 56	35, 48, 82, 149	0
8	V	226/232 (97%)	-0.32	6 (2%) 54 48	35, 48, 84, 165	0
9	I	204/205 (99%)	-0.54	2 (0%) 82 80	33, 48, 81, 97	0
9	W	204/205 (99%)	-0.53	3 (1%) 73 70	34, 49, 80, 99	0
10	J	195/198 (98%)	-0.39	4 (2%) 63 58	33, 51, 76, 119	0
10	X	195/198 (98%)	-0.41	5 (2%) 56 50	34, 51, 78, 129	0
11	K	211/211 (100%)	-0.29	2 (0%) 84 82	41, 59, 89, 114	0
11	Y	211/211 (100%)	-0.30	4 (1%) 66 62	40, 59, 89, 115	0
12	L	222/222 (100%)	-0.36	4 (1%) 68 64	35, 53, 92, 122	0
12	Z	222/222 (100%)	-0.34	4 (1%) 68 64	40, 56, 95, 127	0

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
13	M	233/246 (94%)	-0.58	1 (0%) 92 91	31, 48, 72, 90	0
13	a	233/246 (94%)	-0.51	2 (0%) 84 82	32, 49, 74, 90	0
14	N	196/196 (100%)	-0.56	2 (1%) 82 80	32, 44, 73, 100	0
14	b	196/196 (100%)	-0.56	2 (1%) 82 80	32, 43, 75, 102	0
All	All	6342/6612 (95%)	-0.33	166 (2%) 56 50	30, 54, 96, 190	0

All (166) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	221	ASP	8.6
10	X	1	MET	6.8
3	Q	206	LYS	6.6
1	O	1	MET	6.1
3	Q	240	GLU	6.0
12	L	174	TYR	5.9
8	H	226	GLU	5.8
2	P	218	GLY	5.6
10	J	1	MET	5.6
3	C	50	LEU	5.5
3	Q	238	LYS	5.3
9	W	1	SER	5.3
2	B	219	ALA	5.2
2	P	221	ASP	5.2
1	A	1	MET	5.2
2	P	51	VAL	5.2
6	F	202	ASP	5.1
1	O	2	THR	5.0
8	V	226	GLU	5.0
2	B	51	VAL	4.9
12	Z	174	TYR	4.8
8	V	222	ASP	4.7
5	S	202	ASP	4.6
10	J	194	ASP	4.6
2	P	219	ALA	4.6
3	Q	50	LEU	4.5
2	B	218	GLY	4.4
3	C	239	GLN	4.4
8	V	224	GLN	4.4
3	Q	239	GLN	4.3
2	B	220	ASN	4.3
3	C	206	LYS	4.3

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Mol	Chain	Res	Type	RSRZ
7	G	242	GLN	4.3
1	O	249	ALA	4.2
8	H	224	GLN	4.2
2	P	220	ASN	4.1
3	C	202	GLN	4.1
8	V	221	CYS	4.0
9	I	1	SER	4.0
3	C	235	GLU	3.9
3	C	238	LYS	3.9
5	E	202	ASP	3.9
10	X	194	ASP	3.9
3	Q	225	GLU	3.8
1	A	250	LEU	3.8
10	X	195	PHE	3.8
13	a	1	THR	3.7
8	H	221	CYS	3.7
6	F	205	GLU	3.7
3	Q	235	GLU	3.6
4	R	230	GLU	3.4
10	J	95	ARG	3.4
3	C	49	THR	3.4
3	Q	202	GLN	3.4
1	A	2	THR	3.3
1	O	250	LEU	3.3
5	E	233	ILE	3.3
8	H	222	ASP	3.3
6	T	205	GLU	3.2
4	R	1	ASP	3.2
6	T	180	PRO	3.2
8	V	225	GLU	3.1
2	P	222	GLY	3.1
3	Q	49	THR	3.1
6	T	2	THR	3.1
9	I	131	GLU	3.0
11	K	146	ASP	3.0
2	P	244	THR	3.0
6	F	181	GLU	3.0
3	Q	205	ALA	3.0
6	T	181	GLU	2.9
3	Q	141	ASP	2.9
12	L	165	ASN	2.9
5	S	173	ARG	2.9

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
3	Q	237	GLU	2.9
10	J	193	ASP	2.9
2	P	52	THR	2.9
2	P	59	ASP	2.8
3	C	236	GLN	2.8
12	Z	173	LYS	2.8
3	C	139	ARG	2.7
4	R	117	GLU	2.7
6	F	244	ASN	2.7
12	L	1	GLN	2.7
3	Q	139	ARG	2.7
11	Y	146	ASP	2.7
7	G	2	GLY	2.6
1	O	231	LYS	2.6
5	E	122	TYR	2.6
12	Z	210	ASP	2.6
3	C	180	LYS	2.6
3	Q	187	GLU	2.6
8	H	223	ILE	2.6
2	B	217	LYS	2.6
2	B	201	ASP	2.6
10	X	95	ARG	2.5
3	C	225	GLU	2.5
3	Q	216	ASP	2.5
5	S	233	ILE	2.5
5	S	123	GLY	2.5
14	N	195	GLN	2.5
7	G	241	GLU	2.5
6	T	243	ILE	2.5
1	O	52	SER	2.5
1	O	248	GLU	2.4
4	D	242	GLU	2.4
7	G	3	TYR	2.4
14	b	195	GLN	2.4
3	C	229	GLN	2.4
5	S	225	ASP	2.4
2	B	52	THR	2.4
3	Q	181	GLU	2.4
3	Q	236	GLN	2.4
3	C	234	ILE	2.4
6	F	203	ASN	2.4
6	T	241	LYS	2.3

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Mol	Chain	Res	Type	RSRZ
10	X	193	ASP	2.3
7	U	40	ASP	2.3
1	O	201	GLU	2.3
7	U	242	GLN	2.3
11	Y	182	ASP	2.3
3	C	188	GLU	2.3
6	T	244	ASN	2.3
3	C	232	THR	2.3
6	F	215	CYS	2.3
5	E	201	ARG	2.3
11	Y	211	GLY	2.3
1	A	229	THR	2.3
11	Y	150	GLU	2.3
3	Q	51	LYS	2.3
5	S	3	ASN	2.2
6	T	230	ASP	2.2
4	R	54	ASP	2.2
13	M	47	ASP	2.2
14	b	105	LYS	2.2
1	A	249	ALA	2.2
9	W	124	ASP	2.2
12	L	173	LYS	2.2
5	S	54	GLU	2.2
3	C	216	ASP	2.2
4	D	241	ALA	2.2
5	E	54	GLU	2.2
5	E	123	GLY	2.1
3	Q	188	GLU	2.1
9	W	131	GLU	2.1
4	R	217	GLN	2.1
11	K	107	LYS	2.1
3	Q	234	ILE	2.1
5	E	180	LYS	2.1
13	a	204	THR	2.1
6	F	201	GLU	2.1
3	Q	37	LYS	2.1
14	N	105	LYS	2.1
2	B	59	ASP	2.1
4	R	242	GLU	2.1
1	O	245	ASP	2.1
1	A	248	GLU	2.0
3	C	233	GLN	2.0

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Mol	Chain	Res	Type	RSRZ
3	C	47	ARG	2.0
12	Z	165	ASN	2.0
6	T	215	CYS	2.0
7	U	2	GLY	2.0
8	V	215	GLU	2.0
7	G	222	ASP	2.0
7	G	240	ALA	2.0
3	Q	48	SER	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 6.4 Ligands ⓘ

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.

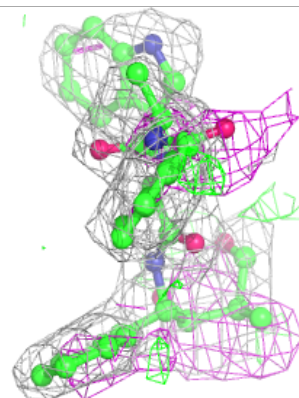
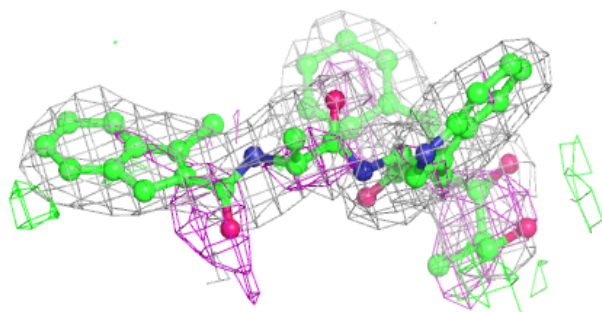
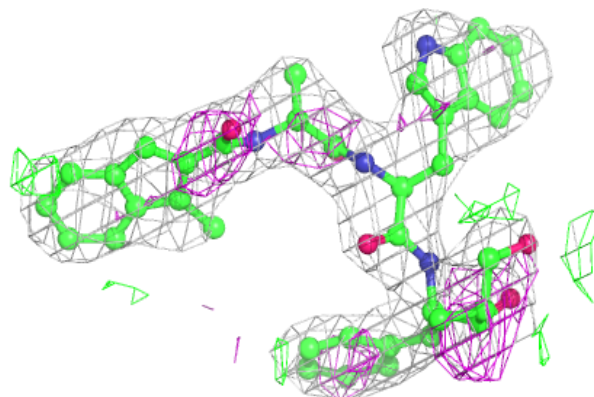
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
17	39V	Y	301	46/46	0.88	0.26	52,61,73,76	0
15	MG	G	301	1/1	0.88	0.07	42,42,42,42	0
17	39V	K	301	46/46	0.90	0.24	49,57,72,72	0
15	MG	I	301	1/1	0.93	0.14	60,60,60,60	0
15	MG	Z	301	1/1	0.94	0.18	65,65,65,65	0
15	MG	G	302	1/1	0.94	0.28	40,40,40,40	0
15	MG	N	201	1/1	0.94	0.12	52,52,52,52	0
15	MG	J	201	1/1	0.94	0.30	61,61,61,61	0
15	MG	L	301	1/1	0.96	0.07	57,57,57,57	0
16	CL	U	301	1/1	0.99	0.13	38,38,38,38	0
15	MG	I	302	1/1	0.99	0.07	54,54,54,54	0
15	MG	K	302	1/1	0.99	0.10	52,52,52,52	0
16	CL	G	303	1/1	0.99	0.13	39,39,39,39	0

The following is a graphical depiction of the model fit to experimental electron density of all

instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

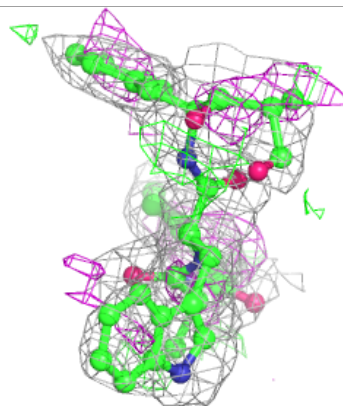
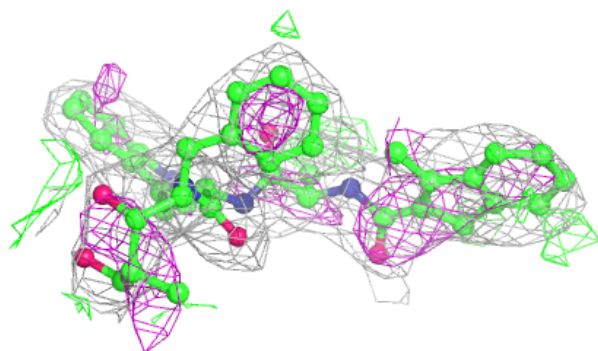
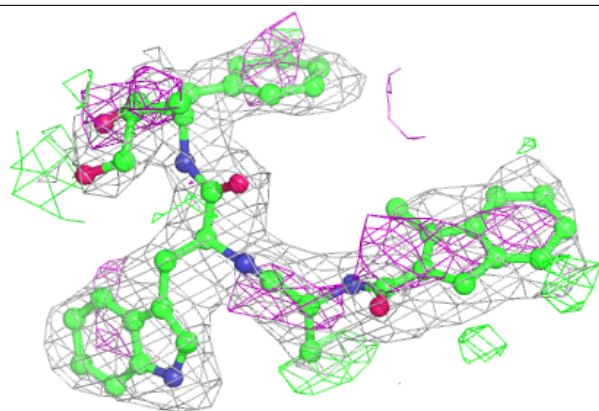
**Electron density around 39V Y 301:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around 39V K 301:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



## 6.5 Other polymers [i](#)

There are no such residues in this entry.