



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 1, 2026 – 06:20 AM UTC

PDB ID : 4HRC / pdb_00004hrc
Title : Crystal structure of yeast 20S proteasome in complex with epoxyketone carma-
phyacin analogue 3
Authors : Trivella, D.B.B.; Stein, M.; Groll, M.
Deposited on : 2012-10-27
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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
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

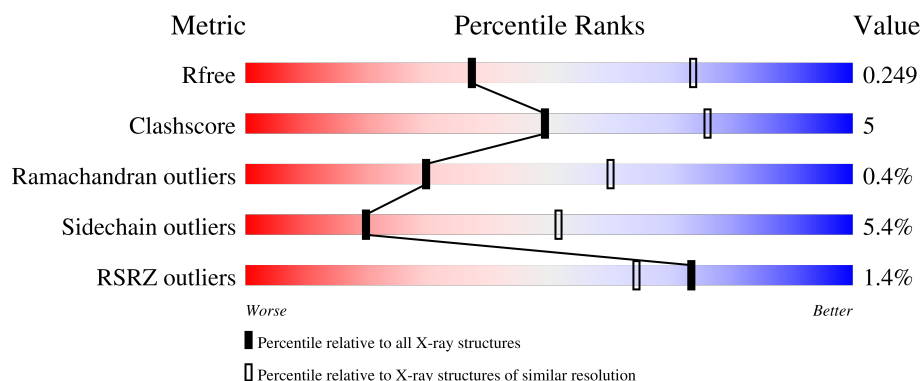
1 Overall quality at a glance

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 ≥ 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	249	 87% 12% .
1	O	249	 87% 12% .
2	B	244	 78% 18% 4% .
2	P	244	 84% 15% .
3	C	241	 80% 17% .

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Mol	Chain	Length	Quality of chain
3	Q	241	4% 83% 15% .
4	D	242	3% 85% 14% .
4	R	242	5% 83% 15% .
5	E	233	% 85% 13% .
5	S	233	2% 84% 14% .
6	F	244	76% 22% .
6	T	244	% 84% 14% .
7	G	243	89% 10% .
7	U	243	% 86% 13% .
8	H	222	86% 13%
8	V	222	% 79% 19% .
9	I	204	88% 12%
9	W	204	86% 14%
10	J	198	2% 88% 12%
10	X	198	2% 89% 9% .
11	K	212	83% 15% .
11	Y	212	84% 15% .
12	L	222	86% 13%
12	Z	222	86% 12% .
13	M	233	2% 83% 15% .
13	a	233	83% 16% .
14	N	196	84% 16% .
14	b	196	88% 11% .

2 Entry composition

There are 16 unique types of molecules in this entry. The entry contains 50159 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 component Y7.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	249	Total	C	N	O	S	0	0	0
			1907	1214	314	376	3			
1	O	249	Total	C	N	O	S	0	0	0
			1907	1214	314	376	3			

- Molecule 2 is a protein called Proteasome component Y13.

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 component PRE6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	241	Total	C	N	O	S	0	0	0
			1890	1181	331	374	4			
3	Q	241	Total	C	N	O	S	0	0	0
			1890	1181	331	374	4			

- Molecule 4 is a protein called Proteasome component PUP2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	242	Total	C	N	O	S	0	0	0
			1861	1162	314	378	7			
4	R	242	Total	C	N	O	S	0	0	0
			1861	1162	314	378	7			

- Molecule 5 is a protein called Proteasome component PRE5.

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

- Molecule 6 is a protein called Proteasome component C1.

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

- Molecule 7 is a protein called Proteasome component C7-alpha.

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

- Molecule 8 is a protein called Proteasome component PUP1.

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

- Molecule 9 is a protein called Proteasome component PUP3.

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 component C11.

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

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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 component PRE2.

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 component C5.

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			

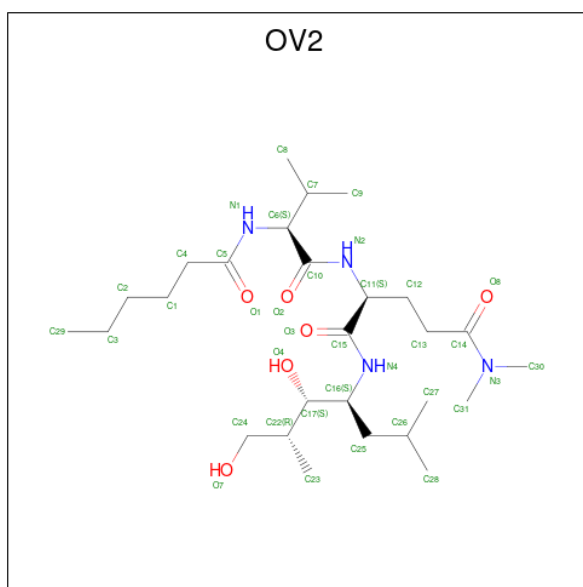
- Molecule 13 is a protein called Proteasome component PRE4.

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 component PRE3.

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 N-hexanoyl-L-valyl-N 1 -[(2R,3S,4S)-1,3-dihydroxy-2,6-dimethylheptan-4-yl]-N 5 ,N 5 -dimethyl-L-glutamamide (CCD ID: OV2) (formula: C₂₇H₅₂N₄O₆).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
15	H	1	Total	C	N	O	0	0
			37	27	4	6		
15	K	1	Total	C	N	O	0	0
			37	27	4	6		
15	N	1	Total	C	N	O	0	0
			37	27	4	6		
15	V	1	Total	C	N	O	0	0
			37	27	4	6		
15	Y	1	Total	C	N	O	0	0
			37	27	4	6		
15	b	1	Total	C	N	O	0	0
			37	27	4	6		

- Molecule 16 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
16	A	10	Total	O	0	0
			10	10		
16	B	20	Total	O	0	0
			20	20		
16	C	13	Total	O	0	0
			13	13		
16	D	17	Total	O	0	0
			17	17		
16	E	18	Total	O	0	0
			18	18		
16	F	15	Total	O	0	0
			15	15		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
16	G	18	Total 18	O 18	0	0
16	H	12	Total 12	O 12	0	0
16	I	19	Total 19	O 19	0	0
16	J	19	Total 19	O 19	0	0
16	K	13	Total 13	O 13	0	0
16	L	22	Total 22	O 22	0	0
16	M	22	Total 22	O 22	0	0
16	N	16	Total 16	O 16	0	0
16	O	19	Total 19	O 19	0	0
16	P	4	Total 4	O 4	0	0
16	Q	13	Total 13	O 13	0	0
16	R	8	Total 8	O 8	0	0
16	S	8	Total 8	O 8	0	0
16	T	11	Total 11	O 11	0	0
16	U	9	Total 9	O 9	0	0
16	V	19	Total 19	O 19	0	0
16	W	13	Total 13	O 13	0	0
16	X	15	Total 15	O 15	0	0
16	Y	15	Total 15	O 15	0	0
16	Z	18	Total 18	O 18	0	0
16	a	11	Total 11	O 11	0	0

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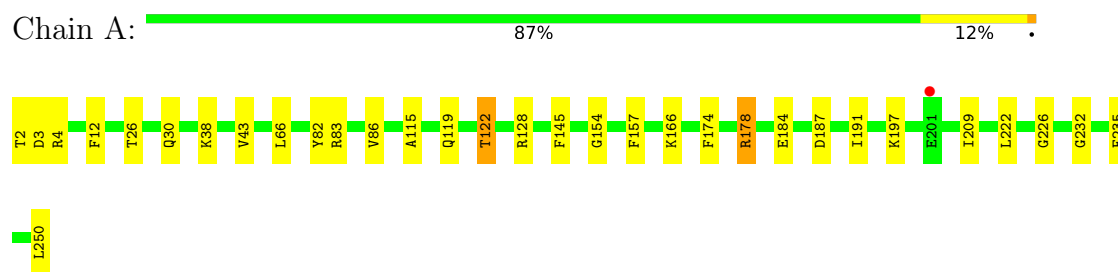
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
16	b	18	Total	O	0	0
			18	18		

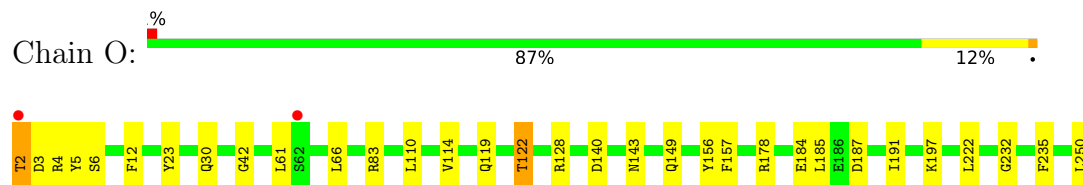
3 Residue-property plots [i](#)

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.

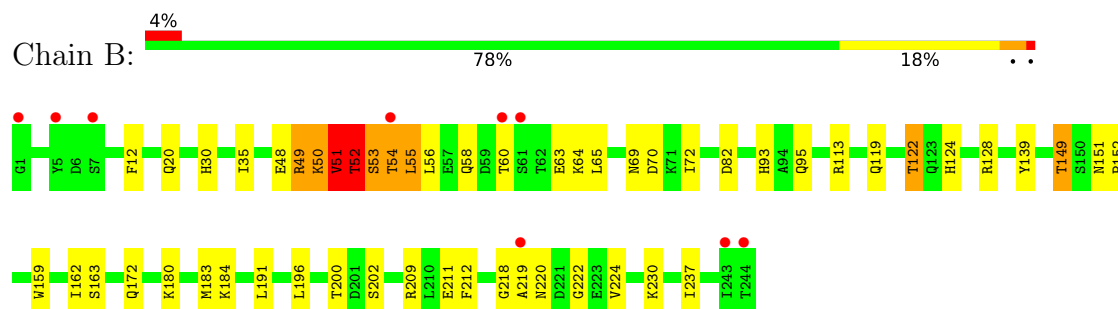
- Molecule 1: Proteasome component Y7



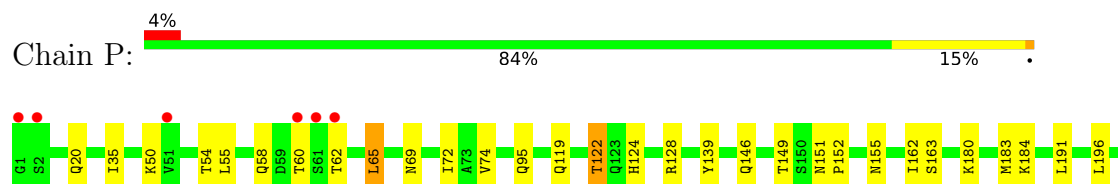
- Molecule 1: Proteasome component Y7

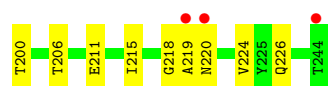


- Molecule 2: Proteasome component Y13

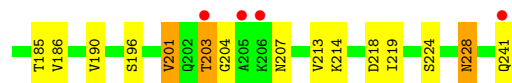
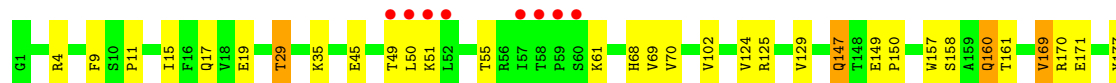
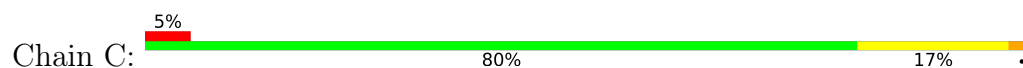


- Molecule 2: Proteasome component Y13

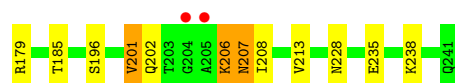
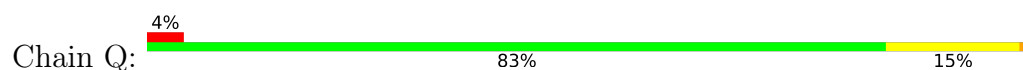




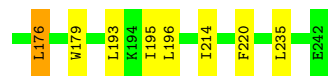
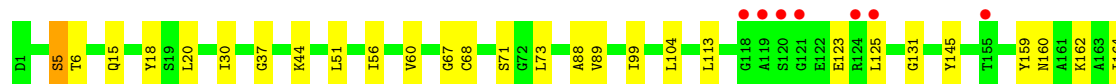
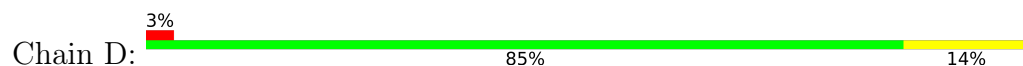
• Molecule 3: Proteasome component PRE6



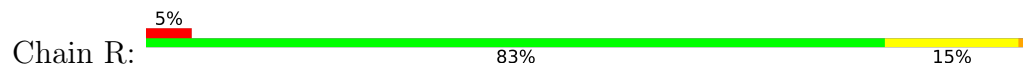
• Molecule 3: Proteasome component PRE6



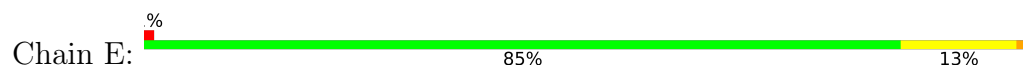
• Molecule 4: Proteasome component PUP2

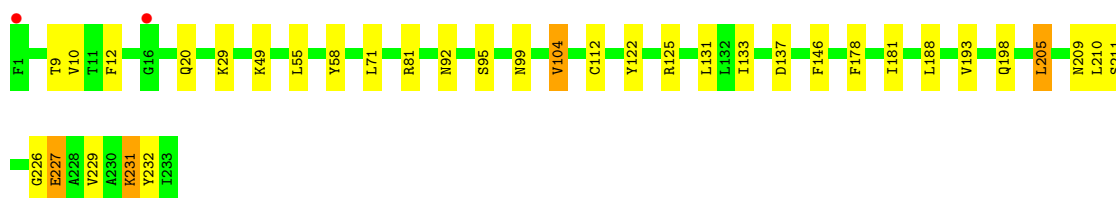


• Molecule 4: Proteasome component PUP2

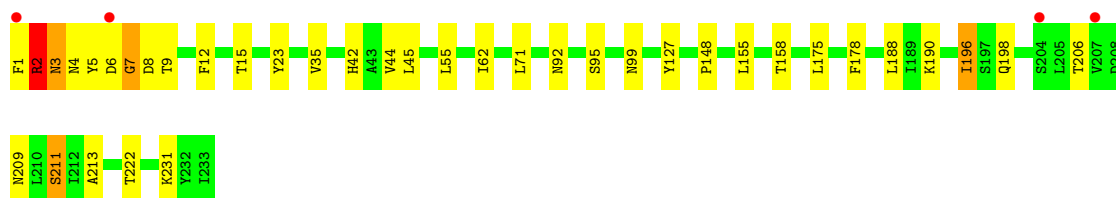
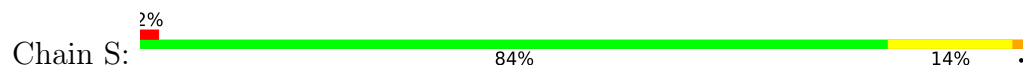


• Molecule 5: Proteasome component PRE5

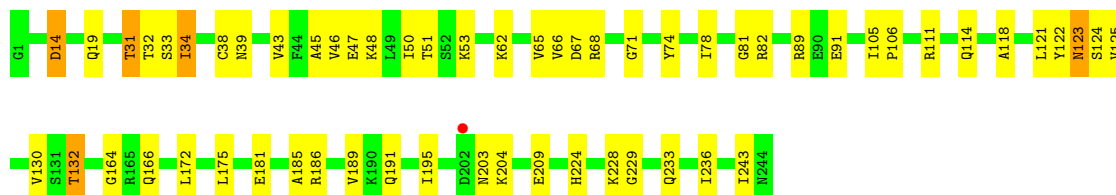
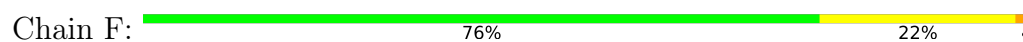




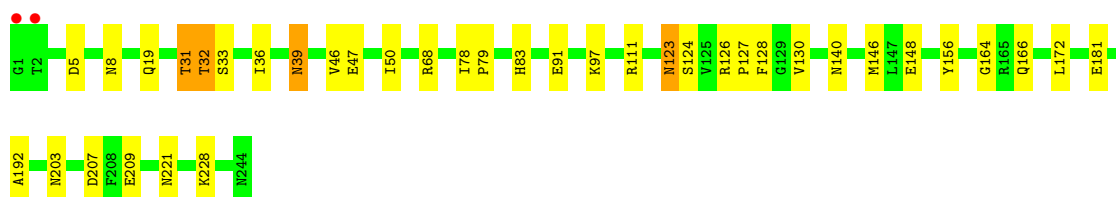
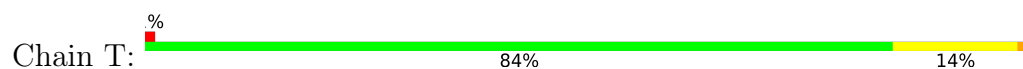
• Molecule 5: Proteasome component PRE5



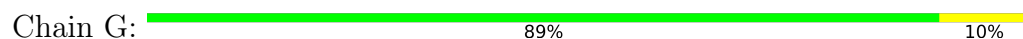
• Molecule 6: Proteasome component C1



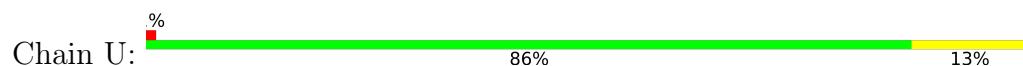
• Molecule 6: Proteasome component C1

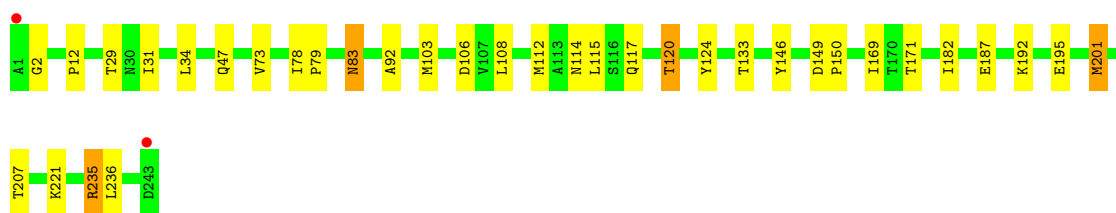


• Molecule 7: Proteasome component C7-alpha



• Molecule 7: Proteasome component C7-alpha





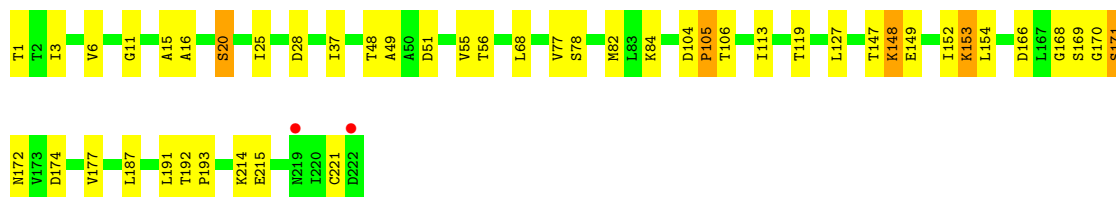
• Molecule 8: Proteasome component PUP1

Chain H: 86% 13%



• Molecule 8: Proteasome component PUP1

Chain V: 79% 19%



• Molecule 9: Proteasome component PUP3

Chain I: 88% 12%



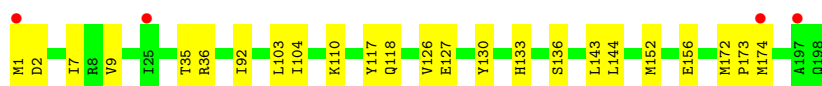
• Molecule 9: Proteasome component PUP3

Chain W: 86% 14%



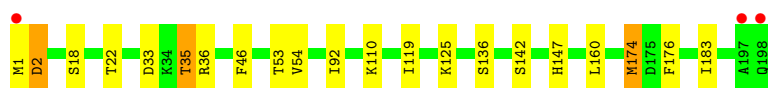
• Molecule 10: Proteasome component C11

Chain J: 88% 12%



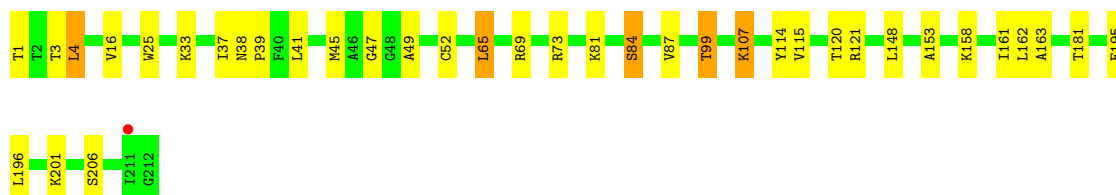
• Molecule 10: Proteasome component C11

Chain X: 89% 9%



• Molecule 11: Proteasome component PRE2

Chain K: 83% 15%



• Molecule 11: Proteasome component PRE2

Chain Y: 84% 15%



• Molecule 12: Proteasome component C5

Chain L: 86% 13%



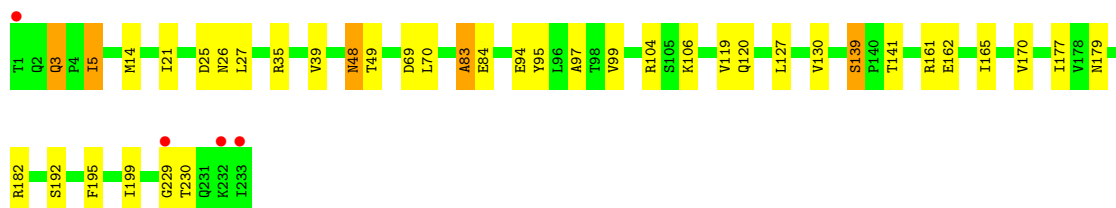
• Molecule 12: Proteasome component C5

Chain Z: 86% 12%

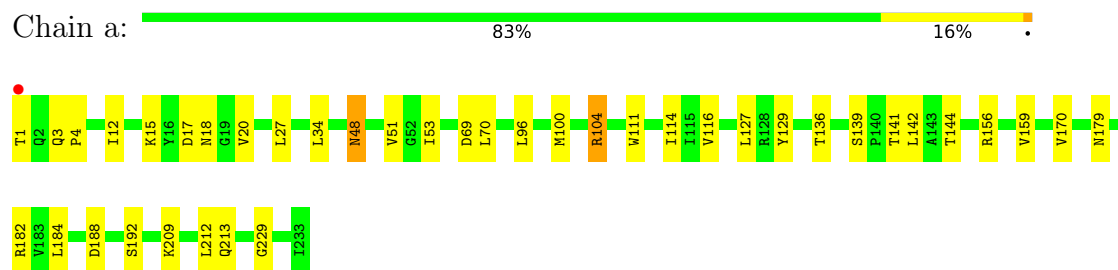


• Molecule 13: Proteasome component PRE4

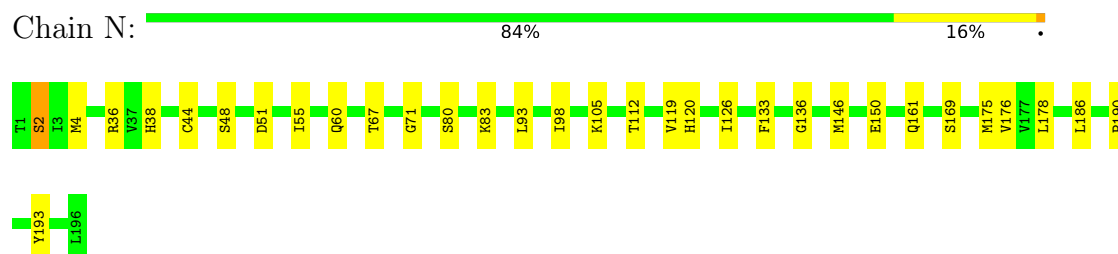
Chain M: 83% 15%



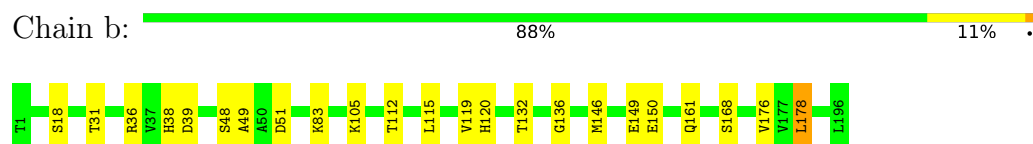
- Molecule 13: Proteasome component PRE4



- Molecule 14: Proteasome component PRE3



- Molecule 14: Proteasome component PRE3



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	135.35Å 300.88Å 144.25Å 90.00° 112.74° 90.00°	Depositor
Resolution (Å)	48.00 – 2.80 48.00 – 2.80	Depositor EDS
% Data completeness (in resolution range)	98.0 (48.00-2.80) 98.0 (48.00-2.80)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.67 (at 2.81Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.210 , 0.243 0.215 , 0.249	Depositor DCC
R_{free} test set	12670 reflections (4.87%)	wwPDB-VP
Wilson B-factor (Å ²)	63.7	Xtriage
Anisotropy	0.168	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 56.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	50159	wwPDB-VP
Average B, all atoms (Å ²)	75.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.38% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: OV2

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	0.43	0/1944	0.77	0/2632
1	O	0.46	0/1944	0.79	0/2632
2	B	0.50	0/1934	0.82	1/2618 (0.0%)
2	P	0.44	0/1934	0.78	0/2618
3	C	0.45	0/1919	0.82	0/2598
3	Q	0.45	0/1919	0.80	1/2598 (0.0%)
4	D	0.44	0/1886	0.81	0/2541
4	R	0.45	0/1886	0.80	0/2541
5	E	0.45	0/1823	0.81	0/2463
5	S	0.52	0/1823	0.82	2/2463 (0.1%)
6	F	0.49	1/1936 (0.1%)	0.82	0/2614
6	T	0.44	0/1936	0.82	0/2614
7	G	0.44	0/1959	0.78	0/2652
7	U	0.44	0/1959	0.77	0/2652
8	H	0.46	0/1715	0.77	0/2326
8	V	0.52	0/1715	0.81	2/2326 (0.1%)
9	I	0.45	0/1611	0.78	0/2174
9	W	0.47	0/1611	0.81	0/2174
10	J	0.44	0/1613	0.82	0/2173
10	X	0.44	0/1613	0.75	0/2173
11	K	0.45	0/1681	0.80	0/2274
11	Y	0.47	0/1681	0.79	1/2274 (0.0%)
12	L	0.45	0/1795	0.78	0/2420
12	Z	0.46	0/1795	0.78	0/2420
13	M	0.46	0/1855	0.79	0/2514
13	a	0.45	0/1855	0.75	0/2514
14	N	0.44	0/1541	0.75	0/2087
14	b	0.41	0/1541	0.76	0/2087
All	All	0.46	1/50424 (0.0%)	0.79	7/68172 (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
2	B	0	1
8	V	0	1
All	All	0	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	F	78	ILE	CA-CB	5.64	1.56	1.54

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	S	2	ARG	N-CA-C	-9.93	100.29	111.71
8	V	11	GLY	N-CA-C	5.89	117.98	110.20
5	S	3	ASN	N-CA-C	-5.84	101.65	110.24
2	B	51	VAL	N-CA-C	5.67	116.41	110.62
3	Q	201	VAL	N-CA-C	5.39	116.87	111.00

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	50	LYS	Peptide
8	V	1	THR	Peptide

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	1907	0	1917	20	0
1	O	1907	0	1917	24	0
2	B	1904	0	1904	47	0
2	P	1904	0	1904	19	0
3	C	1890	0	1903	28	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	Q	1890	0	1903	25	0
4	D	1861	0	1839	19	0
4	R	1861	0	1839	18	0
5	E	1795	0	1800	24	0
5	S	1795	0	1800	36	0
6	F	1896	0	1889	31	0
6	T	1896	0	1889	18	0
7	G	1921	0	1913	15	0
7	U	1921	0	1913	25	0
8	H	1684	0	1685	20	0
8	V	1684	0	1685	28	0
9	I	1581	0	1574	14	0
9	W	1581	0	1574	15	0
10	J	1585	0	1590	10	0
10	X	1585	0	1590	10	0
11	K	1644	0	1592	26	0
11	Y	1644	0	1592	25	0
12	L	1757	0	1711	21	0
12	Z	1757	0	1711	16	0
13	M	1824	0	1832	19	0
13	a	1824	0	1832	20	0
14	N	1512	0	1478	19	0
14	b	1512	0	1478	13	0
15	H	37	0	50	2	0
15	K	37	0	50	3	0
15	N	37	0	50	0	0
15	V	37	0	50	5	0
15	Y	37	0	50	1	0
15	b	37	0	50	2	0
16	A	10	0	0	0	0
16	B	20	0	0	1	0
16	C	13	0	0	0	0
16	D	17	0	0	1	0
16	E	18	0	0	0	0
16	F	15	0	0	1	0
16	G	18	0	0	0	0
16	H	12	0	0	0	0
16	I	19	0	0	1	0
16	J	19	0	0	0	0
16	K	13	0	0	0	0
16	L	22	0	0	0	0
16	M	22	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
16	N	16	0	0	2	0
16	O	19	0	0	1	0
16	P	4	0	0	0	0
16	Q	13	0	0	1	0
16	R	8	0	0	0	0
16	S	8	0	0	0	0
16	T	11	0	0	0	0
16	U	9	0	0	0	0
16	V	19	0	0	1	0
16	W	13	0	0	0	0
16	X	15	0	0	0	0
16	Y	15	0	0	0	0
16	Z	18	0	0	0	0
16	a	11	0	0	0	0
16	b	18	0	0	0	0
All	All	50159	0	49554	533	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 5.

The worst 5 of 533 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)
2:B:51:VAL:C	2:B:52:THR:HG23	1.59	1.24
11:Y:4:LEU:HD23	11:Y:4:LEU:C	1.61	1.19
5:S:2:ARG:HG3	5:S:2:ARG:HH11	0.95	1.04
5:S:2:ARG:HH11	5:S:2:ARG:CG	1.71	1.04
2:B:51:VAL:O	2:B:52:THR:HG23	1.56	1.04

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	247/249 (99%)	240 (97%)	5 (2%)	2 (1%)	16	44
1	O	247/249 (99%)	240 (97%)	7 (3%)	0	100	100
2	B	242/244 (99%)	228 (94%)	12 (5%)	2 (1%)	16	44
2	P	242/244 (99%)	228 (94%)	12 (5%)	2 (1%)	16	44
3	C	239/241 (99%)	231 (97%)	7 (3%)	1 (0%)	30	60
3	Q	239/241 (99%)	230 (96%)	7 (3%)	2 (1%)	16	44
4	D	240/242 (99%)	233 (97%)	6 (2%)	1 (0%)	30	60
4	R	240/242 (99%)	222 (92%)	17 (7%)	1 (0%)	30	60
5	E	231/233 (99%)	219 (95%)	12 (5%)	0	100	100
5	S	231/233 (99%)	217 (94%)	13 (6%)	1 (0%)	30	60
6	F	242/244 (99%)	229 (95%)	10 (4%)	3 (1%)	10	34
6	T	242/244 (99%)	230 (95%)	11 (4%)	1 (0%)	30	60
7	G	241/243 (99%)	231 (96%)	9 (4%)	1 (0%)	30	60
7	U	241/243 (99%)	236 (98%)	4 (2%)	1 (0%)	30	60
8	H	220/222 (99%)	213 (97%)	7 (3%)	0	100	100
8	V	220/222 (99%)	207 (94%)	9 (4%)	4 (2%)	6	23
9	I	202/204 (99%)	190 (94%)	11 (5%)	1 (0%)	24	55
9	W	202/204 (99%)	193 (96%)	9 (4%)	0	100	100
10	J	196/198 (99%)	184 (94%)	11 (6%)	1 (0%)	24	55
10	X	196/198 (99%)	186 (95%)	10 (5%)	0	100	100
11	K	210/212 (99%)	206 (98%)	4 (2%)	0	100	100
11	Y	210/212 (99%)	207 (99%)	3 (1%)	0	100	100
12	L	220/222 (99%)	213 (97%)	7 (3%)	0	100	100
12	Z	220/222 (99%)	209 (95%)	11 (5%)	0	100	100
13	M	231/233 (99%)	219 (95%)	10 (4%)	2 (1%)	14	41
13	a	231/233 (99%)	225 (97%)	5 (2%)	1 (0%)	30	60
14	N	194/196 (99%)	189 (97%)	5 (3%)	0	100	100
14	b	194/196 (99%)	182 (94%)	12 (6%)	0	100	100
All	All	6310/6366 (99%)	6037 (96%)	246 (4%)	27 (0%)	30	60

5 of 27 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	D	123	GLU
5	S	7	GLY
8	V	148	LYS
4	R	2	ARG
8	V	171	SER

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	208/208 (100%)	200 (96%)	8 (4%)	29	64
1	O	208/208 (100%)	197 (95%)	11 (5%)	20	52
2	B	203/203 (100%)	187 (92%)	16 (8%)	11	35
2	P	203/203 (100%)	189 (93%)	14 (7%)	14	41
3	C	213/213 (100%)	193 (91%)	20 (9%)	8	27
3	Q	213/213 (100%)	199 (93%)	14 (7%)	15	43
4	D	198/198 (100%)	189 (96%)	9 (4%)	24	58
4	R	198/198 (100%)	185 (93%)	13 (7%)	15	43
5	E	192/192 (100%)	180 (94%)	12 (6%)	16	45
5	S	192/192 (100%)	179 (93%)	13 (7%)	14	42
6	F	201/201 (100%)	184 (92%)	17 (8%)	10	31
6	T	201/201 (100%)	186 (92%)	15 (8%)	12	37
7	G	207/207 (100%)	197 (95%)	10 (5%)	23	56
7	U	207/207 (100%)	196 (95%)	11 (5%)	20	52
8	H	181/181 (100%)	177 (98%)	4 (2%)	45	78
8	V	181/181 (100%)	172 (95%)	9 (5%)	22	54
9	I	172/172 (100%)	167 (97%)	5 (3%)	37	73
9	W	172/172 (100%)	163 (95%)	9 (5%)	21	53
10	J	175/175 (100%)	166 (95%)	9 (5%)	21	54
10	X	175/175 (100%)	167 (95%)	8 (5%)	24	58

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
11	K	169/169 (100%)	159 (94%)	10 (6%)	18	48
11	Y	169/169 (100%)	162 (96%)	7 (4%)	27	62
12	L	185/185 (100%)	182 (98%)	3 (2%)	55	83
12	Z	185/185 (100%)	177 (96%)	8 (4%)	26	60
13	M	199/199 (100%)	188 (94%)	11 (6%)	19	51
13	a	199/199 (100%)	190 (96%)	9 (4%)	24	58
14	N	162/162 (100%)	157 (97%)	5 (3%)	35	70
14	b	162/162 (100%)	155 (96%)	7 (4%)	26	60
All	All	5330/5330 (100%)	5043 (95%)	287 (5%)	20	51

5 of 287 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
8	V	25	ILE
14	b	178	LEU
8	V	214	LYS
11	Y	147	ASP
9	I	37	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 179 such sidechains are listed below:

Mol	Chain	Res	Type
5	S	99	ASN
9	W	71	ASN
5	S	151	ASN
7	U	28	GLN
10	X	191	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates

There are no oligosaccharides in this entry.

5.6 Ligand geometry

6 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	$\# Z > 2$
15	OV2	K	301	11	36,36,36	0.43	0	44,47,47	1.37	2 (4%)
15	OV2	H	301	8	36,36,36	0.44	0	44,47,47	1.19	2 (4%)
15	OV2	b	301	14	36,36,36	0.41	0	44,47,47	1.31	3 (6%)
15	OV2	V	301	8	36,36,36	0.39	0	44,47,47	1.08	3 (6%)
15	OV2	N	301	14	36,36,36	0.46	0	44,47,47	1.29	4 (9%)
15	OV2	Y	301	11	36,36,36	0.44	0	44,47,47	1.41	3 (6%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
15	OV2	K	301	11	-	20/52/52/52	-
15	OV2	H	301	8	-	13/52/52/52	-
15	OV2	b	301	14	-	14/52/52/52	-
15	OV2	V	301	8	-	19/52/52/52	-
15	OV2	N	301	14	-	14/52/52/52	-
15	OV2	Y	301	11	-	22/52/52/52	-

There are no bond length outliers.

The worst 5 of 17 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
15	Y	301	OV2	C25-C16-N4	-7.47	100.61	110.20
15	K	301	OV2	C25-C16-N4	-6.09	102.39	110.20
15	H	301	OV2	C25-C16-N4	-6.03	102.46	110.20
15	N	301	OV2	C25-C16-N4	-5.91	102.62	110.20
15	b	301	OV2	C25-C16-N4	-5.30	103.39	110.20

There are no chirality outliers.

5 of 102 torsion outliers are listed below:

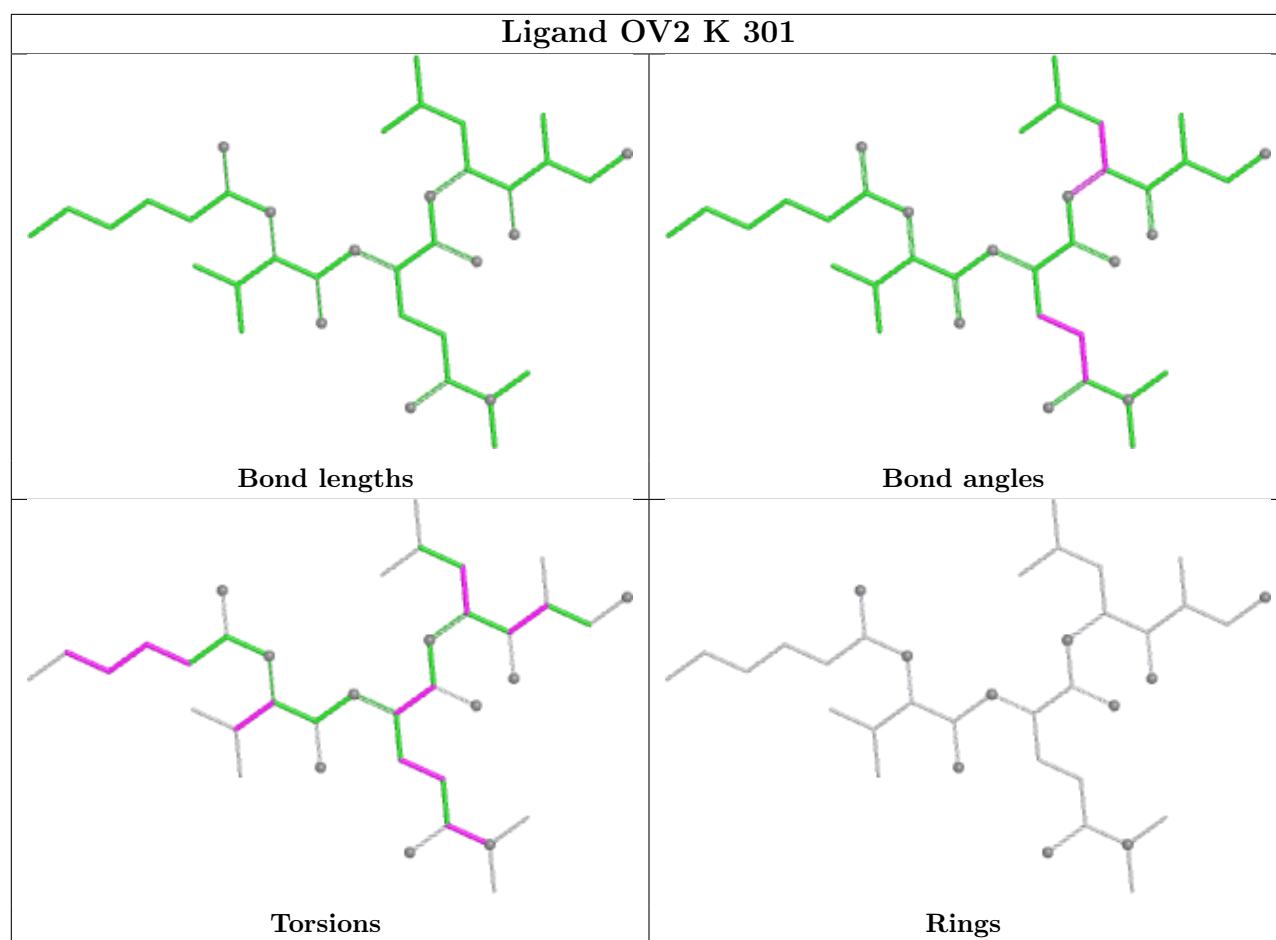
Mol	Chain	Res	Type	Atoms
15	H	301	OV2	C13-C14-N3-C30
15	H	301	OV2	C13-C14-N3-C31
15	H	301	OV2	O8-C14-N3-C30
15	H	301	OV2	O8-C14-N3-C31
15	H	301	OV2	C17-C16-C25-C26

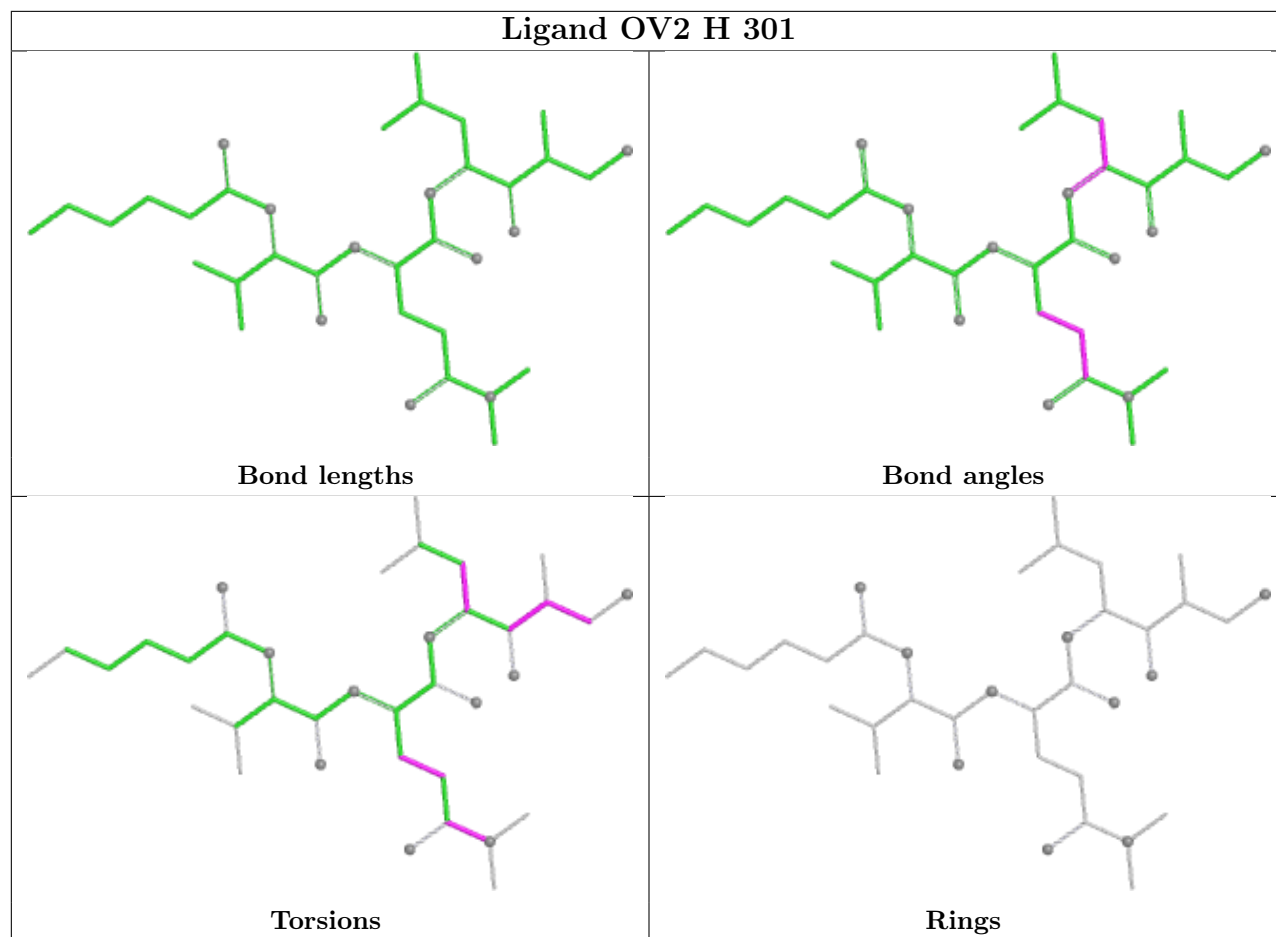
There are no ring outliers.

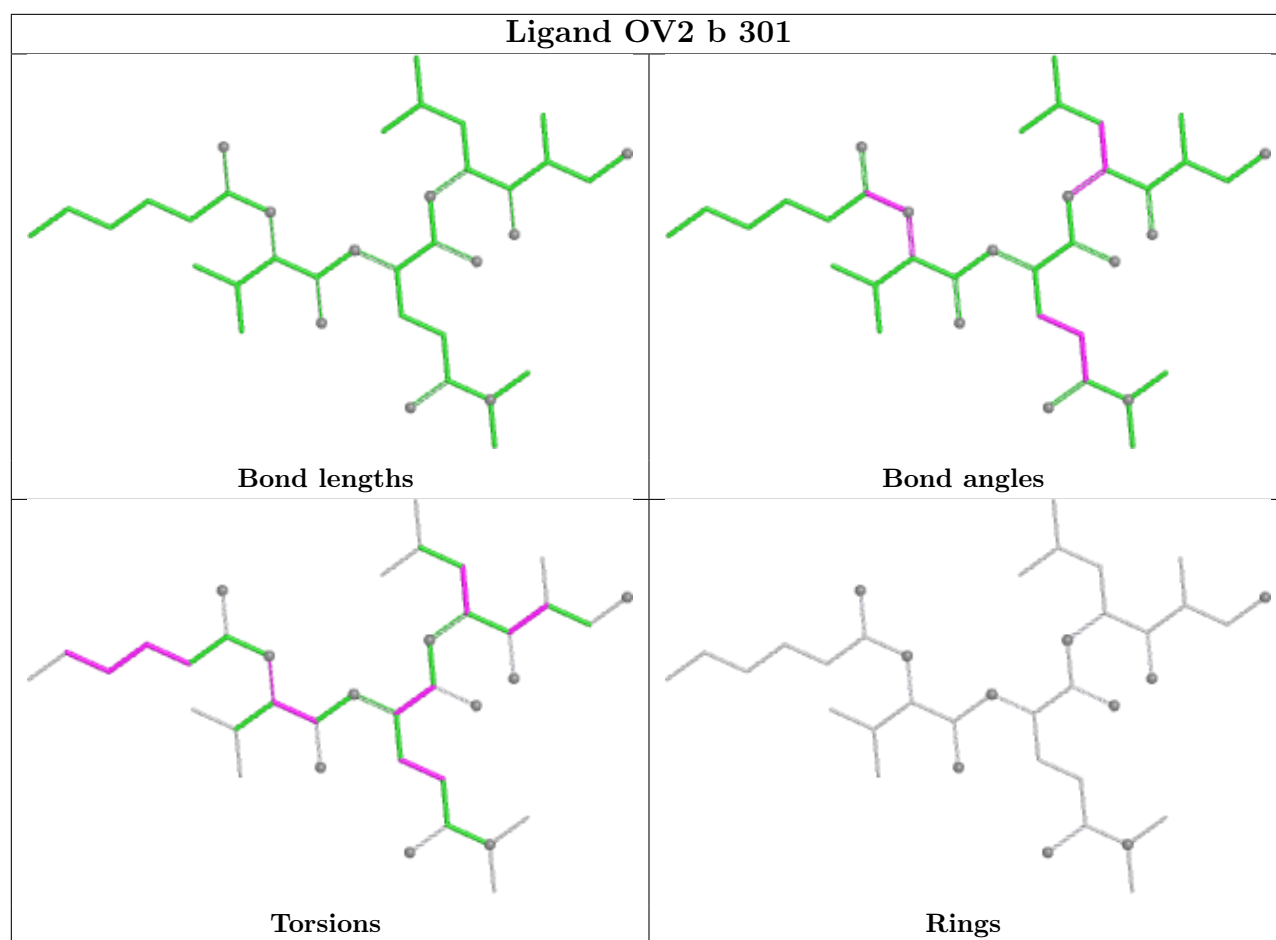
5 monomers are involved in 13 short contacts:

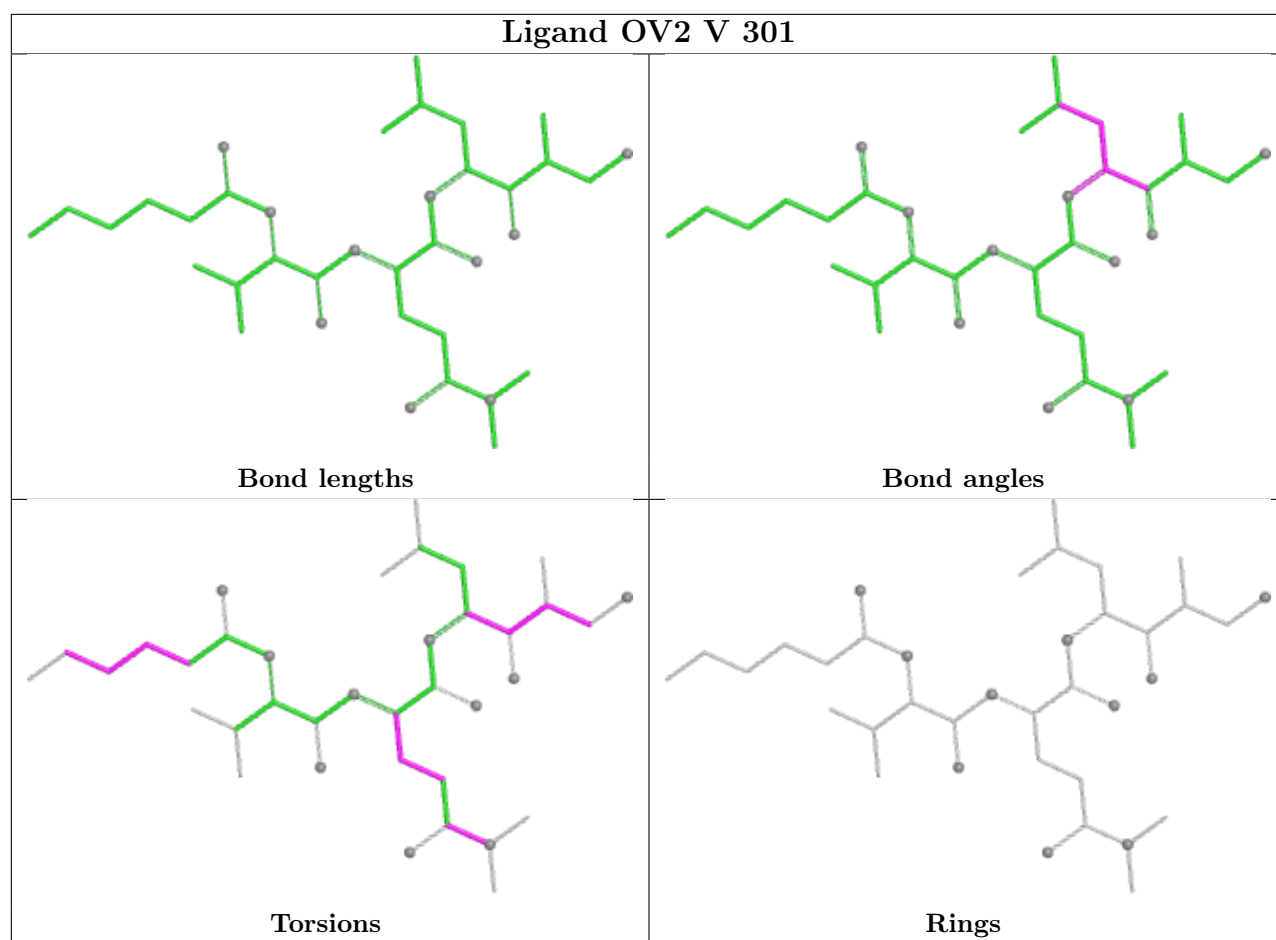
Mol	Chain	Res	Type	Clashes	Symm-Clashes
15	K	301	OV2	3	0
15	H	301	OV2	2	0
15	b	301	OV2	2	0
15	V	301	OV2	5	0
15	Y	301	OV2	1	0

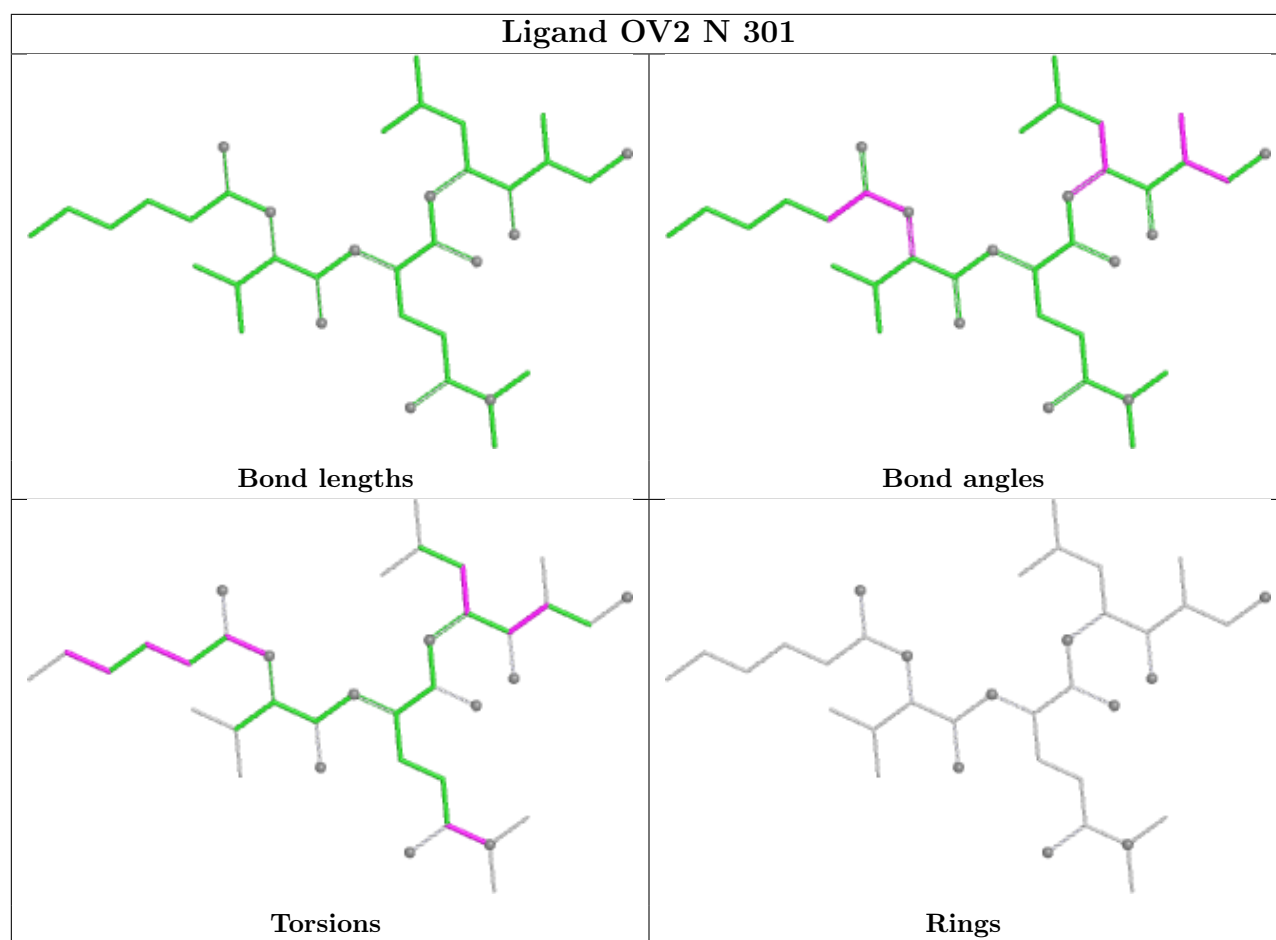
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

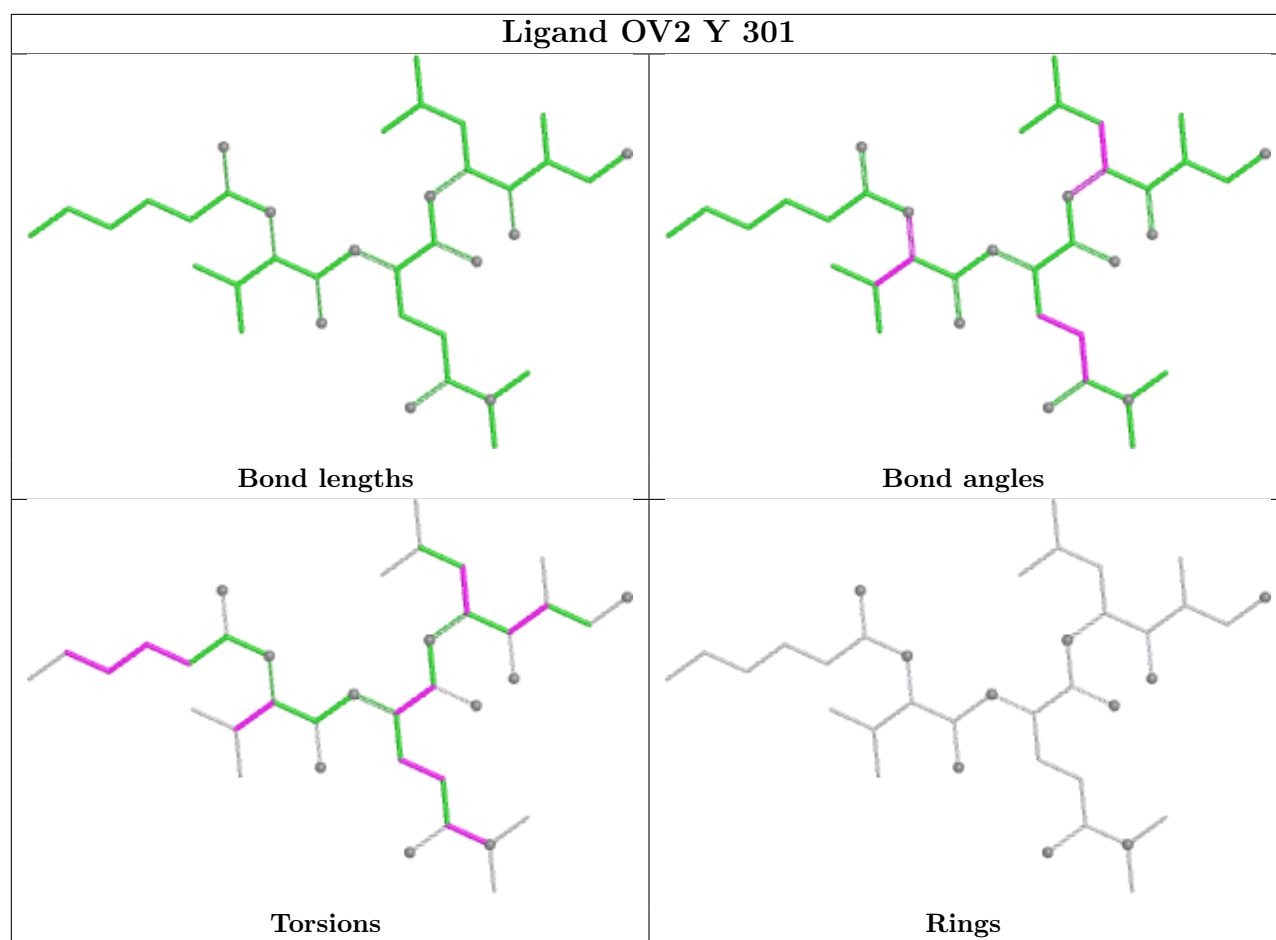












5.7 Other polymers [i](#)

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	249/249 (100%)	-0.04	1 (0%) 88 84	54, 72, 100, 117	0
1	O	249/249 (100%)	-0.05	2 (0%) 82 75	56, 74, 104, 122	0
2	B	244/244 (100%)	0.25	9 (3%) 45 36	51, 78, 119, 137	0
2	P	244/244 (100%)	0.10	9 (3%) 45 36	55, 75, 107, 121	0
3	C	241/241 (100%)	0.13	12 (4%) 34 26	48, 73, 115, 147	0
3	Q	241/241 (100%)	0.19	10 (4%) 41 33	62, 91, 132, 168	0
4	D	242/242 (100%)	0.06	7 (2%) 53 43	54, 74, 101, 122	0
4	R	242/242 (100%)	0.31	12 (4%) 34 26	63, 84, 116, 145	0
5	E	233/233 (100%)	0.29	2 (0%) 81 74	63, 86, 122, 132	0
5	S	233/233 (100%)	0.25	4 (1%) 69 60	53, 87, 119, 129	0
6	F	244/244 (100%)	0.18	1 (0%) 88 84	60, 84, 116, 144	0
6	T	244/244 (100%)	0.02	2 (0%) 82 75	59, 79, 111, 134	0
7	G	243/243 (100%)	0.02	1 (0%) 88 84	58, 78, 105, 126	0
7	U	243/243 (100%)	-0.06	2 (0%) 82 75	57, 73, 100, 118	0
8	H	222/222 (100%)	-0.20	0 100 100	49, 67, 88, 96	0
8	V	222/222 (100%)	0.04	2 (0%) 81 74	50, 66, 90, 120	0
9	I	204/204 (100%)	-0.13	0 100 100	46, 65, 92, 99	0
9	W	204/204 (100%)	-0.26	0 100 100	44, 60, 84, 91	0
10	J	198/198 (100%)	0.04	4 (2%) 65 56	46, 66, 94, 119	0
10	X	198/198 (100%)	-0.20	3 (1%) 72 63	50, 64, 84, 104	0
11	K	212/212 (100%)	-0.33	1 (0%) 87 82	43, 62, 85, 92	0
11	Y	212/212 (100%)	-0.17	1 (0%) 87 82	53, 67, 92, 103	0
12	L	222/222 (100%)	-0.14	1 (0%) 87 82	49, 65, 87, 91	0
12	Z	222/222 (100%)	-0.17	1 (0%) 87 82	48, 67, 91, 100	0

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
13	M	233/233 (100%)	-0.01	4 (1%) 69 60	53, 72, 99, 116	0
13	a	233/233 (100%)	-0.29	1 (0%) 88 84	44, 66, 87, 99	0
14	N	196/196 (100%)	-0.26	0 100 100	53, 64, 87, 93	0
14	b	196/196 (100%)	-0.23	0 100 100	51, 63, 87, 93	0
All	All	6366/6366 (100%)	-0.01	92 (1%) 73 64	43, 72, 109, 168	0

The worst 5 of 92 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	Q	50	LEU	7.3
2	B	1	GLY	5.1
4	D	119	ALA	5.0
4	R	120	SER	4.8
2	P	1	GLY	4.8

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

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

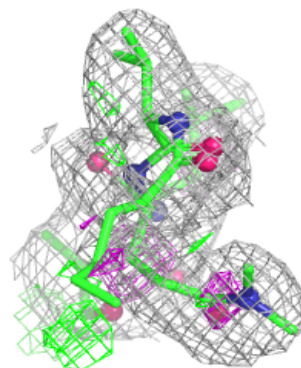
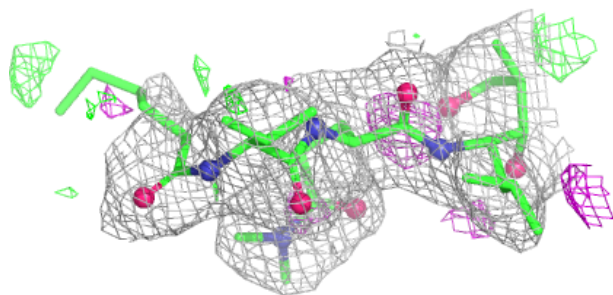
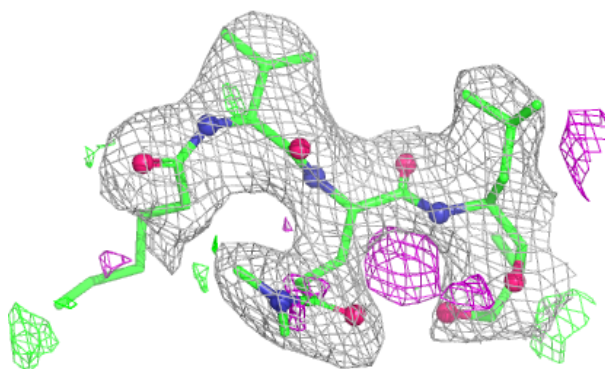
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
15	OV2	N	301	37/37	0.91	0.14	54,59,65,66	0
15	OV2	b	301	37/37	0.91	0.13	53,57,61,61	0
15	OV2	H	301	37/37	0.93	0.12	55,60,62,63	0
15	OV2	V	301	37/37	0.93	0.13	54,58,61,61	0
15	OV2	K	301	37/37	0.93	0.11	51,53,60,61	0
15	OV2	Y	301	37/37	0.94	0.11	55,57,63,64	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.

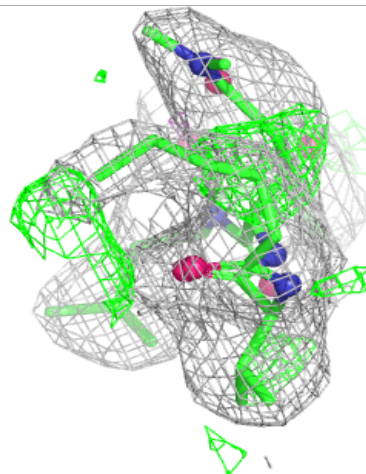
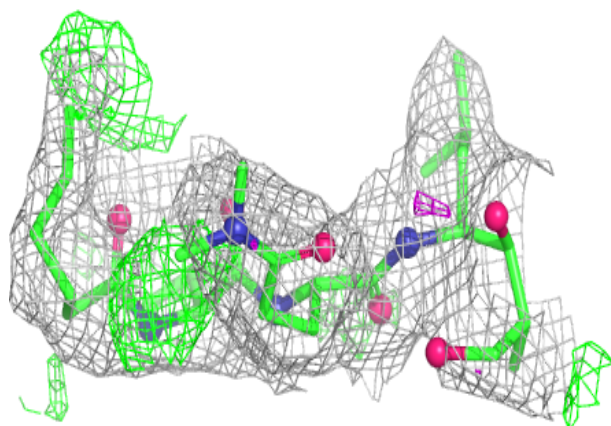
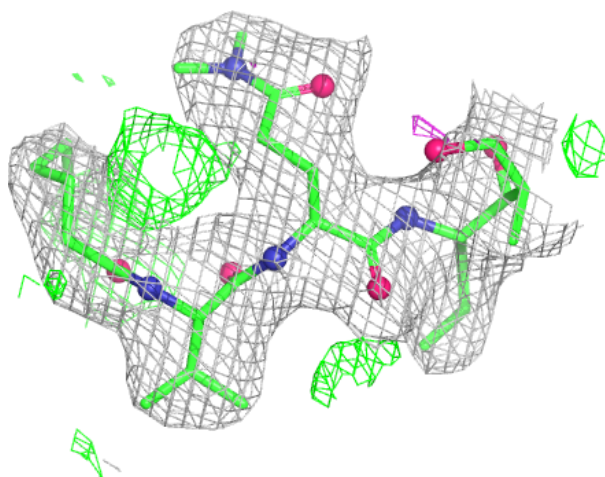
Electron density around OV2 N 301:

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



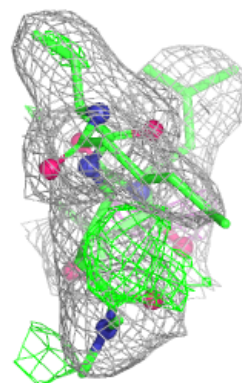
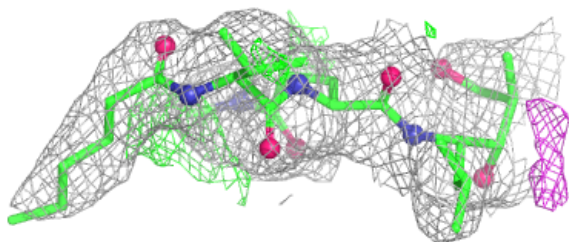
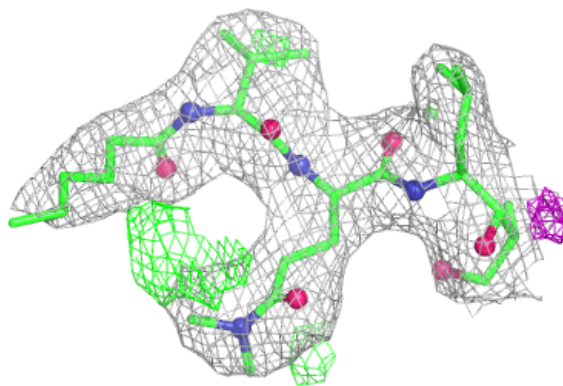
Electron density around OV2 b 301:

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

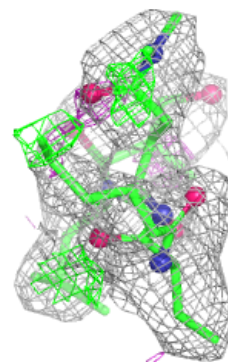
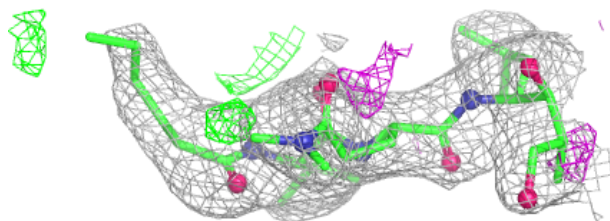
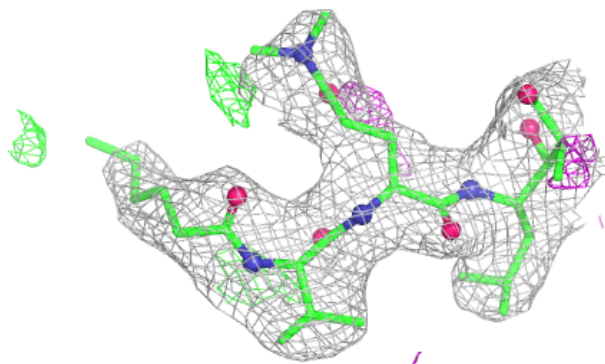


Electron density around OV2 H 301:

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

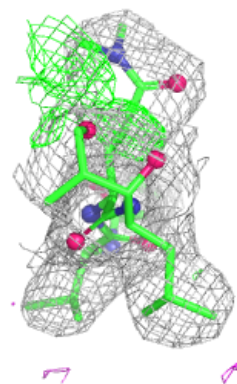
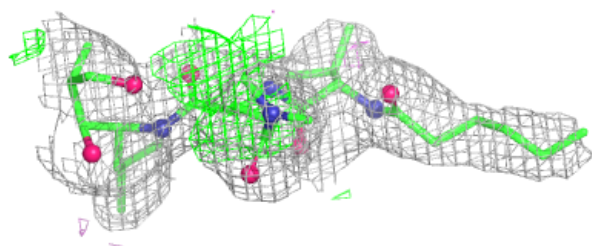
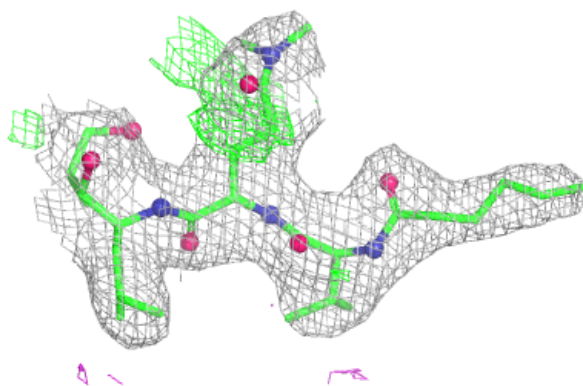
**Electron density around OV2 V 301:**

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

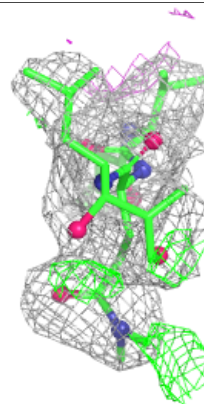
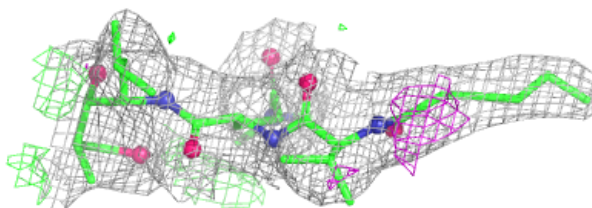
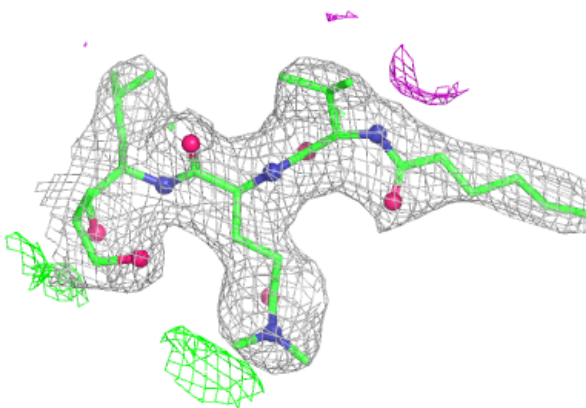


Electron density around OV2 K 301:

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

**Electron density around OV2 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)



6.5 Other polymers [i](#)

There are no such residues in this entry.