



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 09:01 PM UTC

PDB ID : 5L66 / pdb_00005l66
Title : Yeast 20S proteasome with mouse beta5i (1-138) and mouse beta6 (97-111; 118-133) in complex with bortezomib
Authors : Groll, M.; Huber, E.M.
Deposited on : 2016-05-28
Resolution : 2.80 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity	:	4-5-2 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

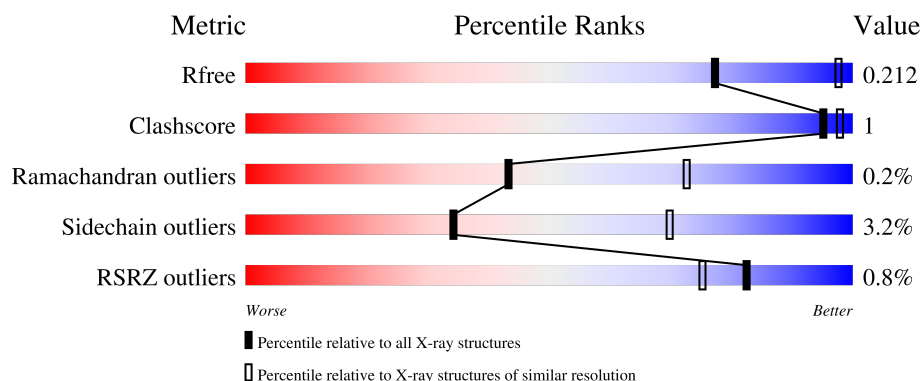
1 Overall quality at a glance

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	250	 98%
1	O	250	 97%
2	B	258	 88% 6% 5%
2	P	258	 88% 6% 5%
3	C	254	 87% 6% 6%

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Mol	Chain	Length	Quality of chain
3	Q	254	 2% 87% 6% • 6%
4	D	260	 85% 5% 10%
4	R	260	 2% 86% 5% 10%
5	E	234	 95% • •
5	S	234	 95% • •
6	F	288	 82% • 16%
6	T	288	 82% • 16%
7	G	252	 90% • • •
7	U	252	 90% 5% • •
8	H	232	 91% 5% • •
8	V	232	 91% 5% • •
9	I	205	 92% 7%
9	W	205	 92% 7%
10	J	198	 92% 5% • •
10	X	198	 91% 5% • • •
11	K	211	 93% 6% •
11	Y	211	 92% 7% •
12	L	222	 94% 5% •
12	Z	222	 95% 5%
13	M	246	 92% • • 5%
13	a	246	 92% • 5%
14	N	196	 95% • •
14	b	196	 95% • •

2 Entry composition

There are 18 unique types of molecules in this entry. The entry contains 49840 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
			1645	1039	281	313	12			
11	Y	211	Total	C	N	O	S	0	0	0
			1645	1039	281	313	12			

- 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	1	0
			1773	1127	305	337	4			

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

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

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

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

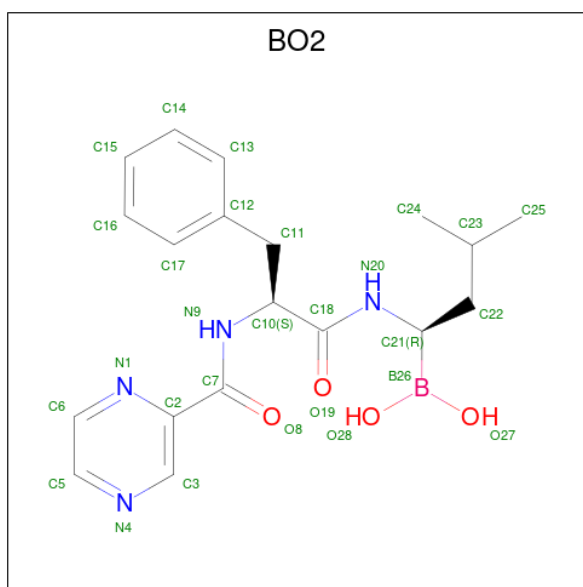
- Molecule 15 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

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

- Molecule 16 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

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

- Molecule 17 is N-[(1R)-1-(DIHYDROXYBORYL)-3-METHYLBUTYL]-N-(PYRAZIN-2-YLCARBONYL)-L-PHENYLALANINAMIDE (CCD ID: BO2) (formula: C₁₉H₂₅BN₄O₄).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
17	H	1	Total	B	C	N	O	0	0
			28	1	19	4	4		
17	K	1	Total	B	C	N	O	0	0
			28	1	19	4	4		
17	N	1	Total	B	C	N	O	0	0
			28	1	19	4	4		
17	V	1	Total	B	C	N	O	0	0
			28	1	19	4	4		
17	Y	1	Total	B	C	N	O	0	0
			28	1	19	4	4		
17	b	1	Total	B	C	N	O	0	0
			28	1	19	4	4		

- Molecule 18 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
18	A	8	Total	O	0	0
			8	8		
18	B	11	Total	O	0	0
			11	11		
18	C	4	Total	O	0	0
			4	4		
18	D	4	Total	O	0	0
			4	4		
18	E	6	Total	O	0	0
			6	6		
18	F	11	Total	O	0	0
			11	11		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
18	G	11	Total O 11 11	0	0
18	H	19	Total O 19 19	0	0
18	I	8	Total O 8 8	0	0
18	J	9	Total O 9 9	0	0
18	K	11	Total O 11 11	0	0
18	L	13	Total O 13 13	0	0
18	M	16	Total O 16 16	0	0
18	N	10	Total O 10 10	0	0
18	O	8	Total O 8 8	0	0
18	P	7	Total O 7 7	0	0
18	Q	7	Total O 7 7	0	0
18	R	9	Total O 9 9	0	0
18	S	6	Total O 6 6	0	0
18	T	8	Total O 8 8	0	0
18	U	12	Total O 12 12	0	0
18	V	15	Total O 15 15	0	0
18	W	8	Total O 8 8	0	0
18	X	8	Total O 8 8	0	0
18	Y	6	Total O 6 6	0	0
18	Z	10	Total O 10 10	0	0
18	a	16	Total O 16 16	0	0

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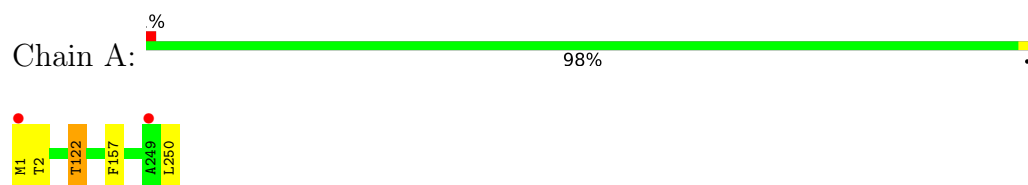
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
18	b	9	Total	O	0	0
			9	9		

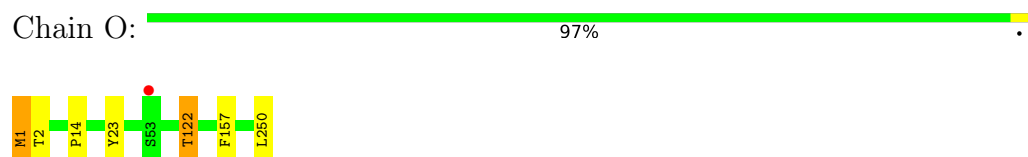
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

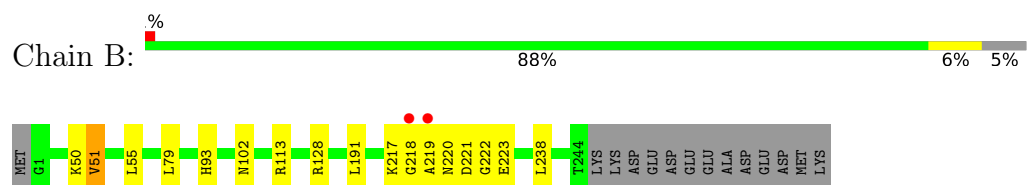
- Molecule 1: Proteasome subunit alpha type-2



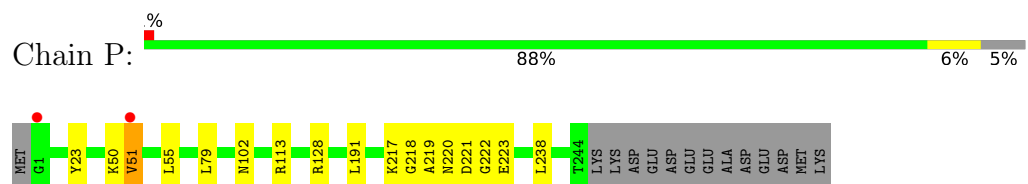
- Molecule 1: Proteasome subunit alpha type-2



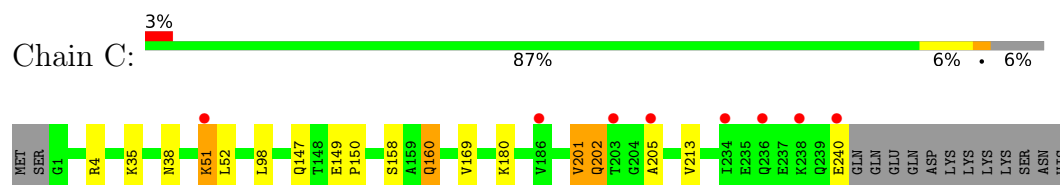
- Molecule 2: Proteasome subunit alpha type-3



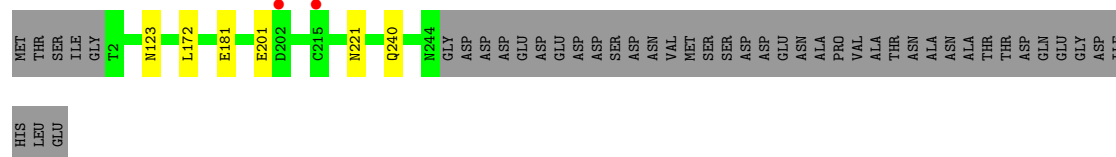
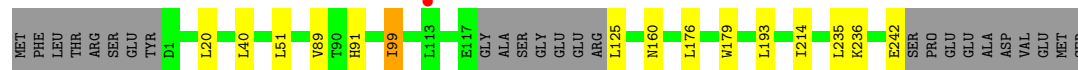
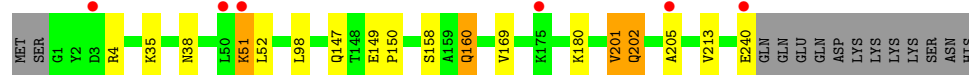
- Molecule 2: Proteasome subunit alpha type-3

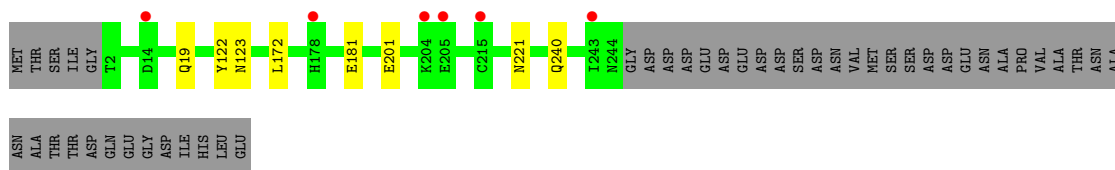


- Molecule 3: Proteasome subunit alpha type-4



- Molecule 3: Proteasome subunit alpha type-4





- Molecule 7: Proteasome subunit alpha type-1

Chain G: 90%



- Molecule 7: Proteasome subunit alpha type-1

Chain U: 90%



- Molecule 8: Proteasome subunit beta type-2

Chain H: 91%



- Molecule 8: Proteasome subunit beta type-2

Chain V: 91%



- Molecule 9: Proteasome subunit beta type-3

Chain I: 92%

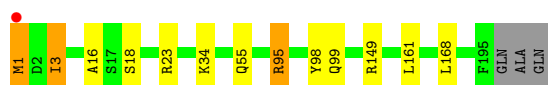
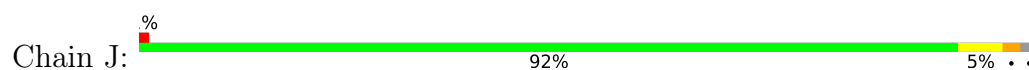


- Molecule 9: Proteasome subunit beta type-3

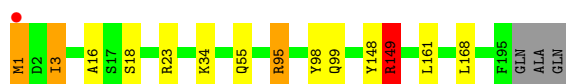
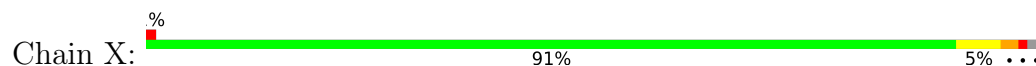
Chain W: 92%



- Molecule 10: Proteasome subunit beta type-4



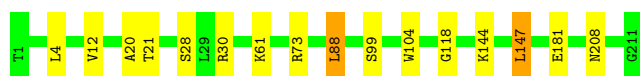
- Molecule 10: Proteasome subunit beta type-4



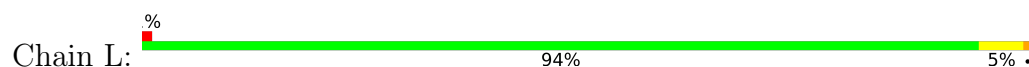
- Molecule 11: Proteasome subunit beta type-8, Proteasome subunit beta type-5



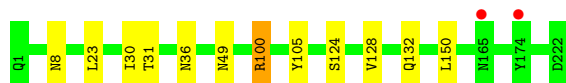
- Molecule 11: Proteasome subunit beta type-8, Proteasome subunit beta type-5



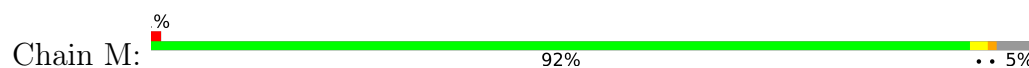
- Molecule 12: Proteasome subunit beta type-6, Proteasome subunit beta type-1, Proteasome subunit beta type-6, Proteasome subunit beta type-1, Proteasome subunit beta type-6

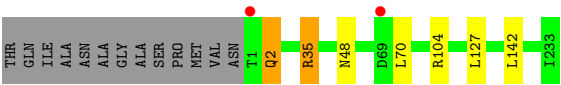


- Molecule 12: Proteasome subunit beta type-6, Proteasome subunit beta type-1, Proteasome subunit beta type-6, Proteasome subunit beta type-1, Proteasome subunit beta type-6

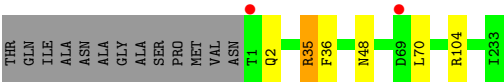
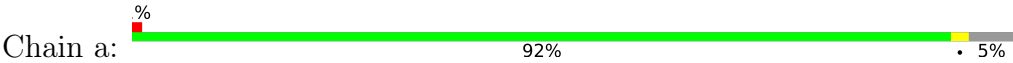


- Molecule 13: Proteasome subunit beta type-7





• 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, α , β , γ	135.31Å 301.13Å 145.75Å 90.00° 112.92° 90.00°	Depositor
Resolution (Å)	15.00 – 2.80 15.00 – 2.80	Depositor EDS
% Data completeness (in resolution range)	98.3 (15.00-2.80) 97.6 (15.00-2.80)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.19 (at 2.81Å)	Xtriage
Refinement program	REFMAC 5.7.0032	Depositor
R, R_{free}	0.182 , 0.210 0.187 , 0.212	Depositor DCC
R_{free} test set	12828 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	60.7	Xtriage
Anisotropy	0.034	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 53.2	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	0.95	EDS
Total number of atoms	49840	wwPDB-VP
Average B, all atoms (Å ²)	65.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.33% 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: BO2, MG, CL

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.40	0/1952	0.68	0/2642
1	O	0.40	0/1952	0.68	0/2642
2	B	0.41	0/1934	0.67	0/2618
2	P	0.41	0/1934	0.67	0/2618
3	C	0.40	0/1910	0.69	1/2586 (0.0%)
3	Q	0.40	0/1910	0.69	1/2586 (0.0%)
4	D	0.39	0/1837	0.66	0/2475
4	R	0.39	0/1837	0.65	0/2475
5	E	0.40	0/1800	0.65	0/2433
5	S	0.40	0/1800	0.65	0/2433
6	F	0.41	0/1932	0.70	0/2609
6	T	0.41	0/1932	0.70	0/2609
7	G	0.39	0/1945	0.76	3/2634 (0.1%)
7	U	0.40	0/1945	0.76	4/2634 (0.2%)
8	H	0.36	0/1750	0.65	0/2373
8	V	0.36	0/1750	0.65	0/2373
9	I	0.35	0/1611	0.76	4/2174 (0.2%)
9	W	0.36	0/1611	0.76	2/2174 (0.1%)
10	J	0.38	0/1589	0.85	7/2142 (0.3%)
10	X	0.38	0/1589	0.87	7/2142 (0.3%)
11	K	0.36	0/1681	0.78	3/2268 (0.1%)
11	Y	0.36	0/1681	0.76	3/2268 (0.1%)
12	L	0.39	0/1802	0.76	3/2430 (0.1%)
12	Z	0.37	0/1815	0.75	3/2448 (0.1%)
13	M	0.53	2/1855 (0.1%)	0.78	5/2514 (0.2%)
13	a	0.52	2/1855 (0.1%)	0.78	6/2514 (0.2%)
14	N	0.37	0/1541	0.67	0/2087
14	b	0.36	0/1541	0.66	0/2087
All	All	0.40	4/50291 (0.0%)	0.72	52/67988 (0.1%)

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
7	G	0	1
7	U	0	1
10	J	0	1
10	X	0	2
All	All	0	5

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
13	M	35	ARG	CZ-NH2	-12.65	1.17	1.33
13	a	35	ARG	CZ-NH2	-11.72	1.18	1.33
13	a	35	ARG	CZ-NH1	-10.27	1.18	1.32
13	M	35	ARG	CZ-NH1	-9.43	1.19	1.32

All (52) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	W	126	ILE	CG1-CB-CG2	-12.35	73.64	110.70
13	a	35	ARG	NH1-CZ-NH2	-12.14	103.52	119.30
13	M	35	ARG	NH1-CZ-NH2	-12.10	103.57	119.30
11	K	73	ARG	NE-CZ-NH2	11.60	129.64	119.20
10	X	95	ARG	NE-CZ-NH1	-11.58	109.92	121.50
12	L	100	ARG	NE-CZ-NH2	11.41	129.47	119.20
7	G	68	ARG	NE-CZ-NH1	-11.12	110.38	121.50
7	U	68	ARG	NE-CZ-NH2	-11.04	109.26	119.20
11	K	73	ARG	NE-CZ-NH1	-10.90	110.60	121.50
10	X	149	ARG	NE-CZ-NH2	-10.83	109.45	119.20
12	L	100	ARG	NE-CZ-NH1	-10.78	110.72	121.50
10	J	149	ARG	NE-CZ-NH1	-10.62	110.88	121.50
12	Z	100	ARG	NE-CZ-NH2	-10.55	109.70	119.20
7	U	68	ARG	CD-NE-CZ	10.28	138.79	124.40
7	G	68	ARG	NE-CZ-NH2	10.25	128.43	119.20
10	X	95	ARG	NE-CZ-NH2	10.20	128.38	119.20
9	I	126	ILE	CG1-CB-CG2	-10.18	80.15	110.70
10	J	149	ARG	NE-CZ-NH2	10.09	128.28	119.20
10	X	149	ARG	CD-NE-CZ	9.93	138.30	124.40
13	M	35	ARG	NE-CZ-NH2	9.84	128.05	119.20
10	X	95	ARG	CD-NE-CZ	9.73	138.02	124.40
11	Y	73	ARG	NE-CZ-NH2	-9.51	110.64	119.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
10	J	95	ARG	NE-CZ-NH2	-9.39	110.75	119.20
7	G	68	ARG	CD-NE-CZ	9.15	137.21	124.40
10	X	23	ARG	CB-CG-CD	9.09	132.22	111.30
12	Z	100	ARG	CD-NE-CZ	9.07	137.10	124.40
10	J	23	ARG	CB-CG-CD	9.05	132.11	111.30
12	Z	100	ARG	NE-CZ-NH1	8.85	130.35	121.50
13	a	35	ARG	NE-CZ-NH1	8.84	130.34	121.50
9	I	126	ILE	CA-CB-CG1	8.66	125.12	110.40
11	Y	73	ARG	CD-NE-CZ	8.38	136.14	124.40
10	J	95	ARG	CD-NE-CZ	8.37	136.12	124.40
10	J	149	ARG	CD-NE-CZ	8.34	136.07	124.40
12	L	100	ARG	CD-NE-CZ	8.34	136.07	124.40
11	Y	73	ARG	NE-CZ-NH1	8.31	129.81	121.50
11	K	73	ARG	CD-NE-CZ	8.21	135.89	124.40
9	W	126	ILE	CA-CB-CG1	7.90	123.83	110.40
13	a	35	ARG	NE-CZ-NH2	7.71	126.14	119.20
13	M	35	ARG	CB-CG-CD	7.47	128.49	111.30
13	a	35	ARG	CB-CG-CD	7.00	127.40	111.30
13	M	35	ARG	NE-CZ-NH1	6.87	128.37	121.50
9	I	126	ILE	CB-CG1-CD1	-6.81	99.50	113.80
10	J	95	ARG	NE-CZ-NH1	6.49	127.99	121.50
7	U	68	ARG	NE-CZ-NH1	6.25	127.75	121.50
10	X	149	ARG	NE-CZ-NH1	6.07	127.57	121.50
9	I	126	ILE	N-CA-C	5.93	117.89	112.43
7	U	68	ARG	CG-CD-NE	-5.86	99.11	112.00
3	C	201	VAL	N-CA-C	5.64	116.37	110.62
3	Q	201	VAL	N-CA-C	5.60	116.33	110.62
13	M	35	ARG	CG-CD-NE	5.46	124.02	112.00
13	a	35	ARG	CG-CD-NE	5.39	123.85	112.00
13	a	35	ARG	N-CA-C	5.35	116.92	111.14

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
7	G	68	ARG	Sidechain
10	J	95	ARG	Sidechain
7	U	68	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	4	0
2	B	1904	0	1904	5	0
2	P	1904	0	1904	6	0
3	C	1881	0	1895	6	0
3	Q	1881	0	1895	6	0
4	D	1813	0	1797	3	0
4	R	1813	0	1797	1	0
5	E	1773	0	1775	1	0
5	S	1773	0	1775	2	0
6	F	1892	0	1883	0	0
6	T	1892	0	1883	2	0
7	G	1907	0	1901	3	0
7	U	1907	0	1901	4	0
8	H	1719	0	1718	9	0
8	V	1719	0	1718	8	0
9	I	1581	0	1574	10	0
9	W	1581	0	1574	13	0
10	J	1561	0	1569	8	0
10	X	1561	0	1569	8	0
11	K	1645	0	1591	6	0
11	Y	1645	0	1591	6	0
12	L	1764	0	1716	4	0
12	Z	1773	0	1725	4	0
13	M	1824	0	1832	2	0
13	a	1824	0	1832	1	0
14	N	1512	0	1480	4	0
14	b	1512	0	1480	4	0
15	G	1	0	0	0	0
15	I	1	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	N	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
16	U	1	0	0	0	0
16	b	1	0	0	0	0
17	H	28	0	25	0	0
17	K	28	0	25	0	0
17	N	28	0	25	1	0
17	V	28	0	25	0	0
17	Y	28	0	25	0	0
17	b	28	0	25	1	0
18	A	8	0	0	0	0
18	B	11	0	0	1	0
18	C	4	0	0	0	0
18	D	4	0	0	0	0
18	E	6	0	0	0	0
18	F	11	0	0	0	0
18	G	11	0	0	0	0
18	H	19	0	0	0	0
18	I	8	0	0	0	0
18	J	9	0	0	0	0
18	K	11	0	0	0	0
18	L	13	0	0	0	0
18	M	16	0	0	1	0
18	N	10	0	0	0	0
18	O	8	0	0	0	0
18	P	7	0	0	0	0
18	Q	7	0	0	0	0
18	R	9	0	0	0	0
18	S	6	0	0	0	0
18	T	8	0	0	0	0
18	U	12	0	0	0	0
18	V	15	0	0	0	0
18	W	8	0	0	0	0
18	X	8	0	0	0	0
18	Y	6	0	0	0	0
18	Z	10	0	0	0	0
18	a	16	0	0	0	0
18	b	9	0	0	0	0
All	All	49840	0	49287	119	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 (119) 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)
9:I:98:ARG:HD2	9:I:126:ILE:HD12	1.62	0.80
9:W:98:ARG:HD2	9:W:126:ILE:HD12	1.62	0.80
10:X:55:GLN:NE2	10:X:98:TYR:OH	2.19	0.75
10:J:55:GLN:NE2	10:J:98:TYR:OH	2.20	0.74
8:V:113:ILE:HG13	8:V:119:THR:HG22	1.70	0.73
8:H:113:ILE:HG13	8:H:119:THR:HG22	1.73	0.71
9:W:125:LEU:HD23	9:W:126:ILE:HG22	1.73	0.70
8:V:35:HIS:HB3	8:V:56:THR:HG21	1.77	0.66
8:H:35:HIS:HB3	8:H:56:THR:HG21	1.77	0.64
9:W:98:ARG:HD2	9:W:126:ILE:CD1	2.28	0.62
2:B:93:HIS:HB3	18:B:301:HOH:O	2.01	0.59
8:H:196:ARG:NH2	9:I:150:GLU:O	2.37	0.58
14:b:152:VAL:HA	14:b:175:MET:HE1	1.85	0.57
11:K:208:ASN:O	9:W:38:LYS:NZ	2.38	0.57
14:N:152:VAL:HA	14:N:175:MET:HE1	1.86	0.56
9:I:38:LYS:NZ	11:Y:208:ASN:O	2.38	0.56
13:a:35:ARG:HD2	13:a:36:PHE:CZ	2.41	0.56
10:J:3:ILE:HD11	10:J:168:LEU:HD13	1.88	0.56
10:X:3:ILE:HD11	10:X:168:LEU:HD13	1.88	0.55
10:J:1:MET:HG2	10:J:34:LYS:HE3	1.89	0.54
10:X:1:MET:HG2	10:X:34:LYS:HE3	1.89	0.54
9:I:98:ARG:CD	9:I:126:ILE:HD12	2.34	0.54
13:M:2:GLN:NE2	18:M:301:HOH:O	2.41	0.54
12:L:100:ARG:HD2	12:L:105:TYR:CZ	2.44	0.53
8:H:113:ILE:CG1	8:H:119:THR:HG22	2.39	0.53
10:J:3:ILE:CD1	10:J:168:LEU:HD13	2.39	0.52
10:X:3:ILE:CD1	10:X:168:LEU:HD13	2.40	0.52
7:U:23:PHE:O	7:U:26:THR:HB	2.09	0.52
7:G:23:PHE:O	7:G:26:THR:HB	2.09	0.52
12:Z:31:THR:HG23	12:Z:36:ASN:HD21	1.75	0.52
12:L:31:THR:HG23	12:L:36:ASN:HD21	1.75	0.52
8:V:113:ILE:CG1	8:V:119:THR:HG22	2.39	0.51
1:O:1:MET:HG3	6:T:122:TYR:CZ	2.46	0.51
2:P:50:LYS:O	2:P:51:VAL:C	2.54	0.50
3:C:201:VAL:O	3:C:202:GLN:CB	2.59	0.50
3:Q:201:VAL:O	3:Q:202:GLN:CB	2.59	0.50
2:B:50:LYS:O	2:B:51:VAL:C	2.54	0.49
3:C:51:LYS:O	3:C:52:LEU:HB2	2.12	0.49
3:Q:51:LYS:O	3:Q:52:LEU:HB2	2.11	0.49
10:J:16:ALA:HB2	10:J:161:LEU:HD21	1.95	0.49
8:V:196:ARG:NH2	9:W:150:GLU:O	2.45	0.48
10:X:16:ALA:HB2	10:X:161:LEU:HD21	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
9:W:98:ARG:CD	9:W:126:ILE:CD1	2.93	0.47
2:B:217:LYS:C	2:B:219:ALA:H	2.23	0.47
14:b:83:LYS:HG3	14:b:119:VAL:CG2	2.45	0.46
3:C:160:GLN:HE21	3:C:160:GLN:HA	1.80	0.46
3:Q:160:GLN:HE21	3:Q:160:GLN:HA	1.80	0.46
2:P:217:LYS:C	2:P:219:ALA:H	2.23	0.46
8:H:52:THR:O	8:H:56:THR:HB	2.16	0.46
12:Z:100:ARG:HD3	12:Z:105:TYR:CE2	2.50	0.46
14:N:83:LYS:HG3	14:N:119:VAL:CG2	2.45	0.46
8:V:52:THR:O	8:V:56:THR:HB	2.16	0.46
9:W:125:LEU:CD2	9:W:126:ILE:HG22	2.45	0.45
9:W:126:ILE:HD13	9:W:126:ILE:HG21	1.42	0.45
8:V:104:ASP:HB2	8:V:105:PRO:HD2	1.97	0.45
11:Y:20:ALA:HB3	11:Y:28:SER:HB3	1.99	0.45
8:H:104:ASP:HB2	8:H:105:PRO:HD2	1.98	0.45
11:K:20:ALA:HB3	11:K:28:SER:HB3	1.99	0.45
2:P:50:LYS:HD3	2:P:50:LYS:HA	1.85	0.45
10:J:3:ILE:HG22	10:J:18:SER:HB3	1.99	0.45
14:N:176:VAL:HG12	14:N:178:LEU:HD13	1.98	0.45
9:W:10:ILE:HG21	9:W:141:ALA:HB3	1.99	0.45
10:X:3:ILE:HG22	10:X:18:SER:HB3	1.99	0.44
11:Y:144:LYS:HB2	11:Y:147:LEU:HD13	1.99	0.44
3:Q:201:VAL:O	3:Q:202:GLN:HB3	2.17	0.44
11:K:144:LYS:HB2	11:K:147:LEU:HD13	1.99	0.44
14:N:21:THR:O	17:N:201:BO2:H3	2.18	0.44
14:b:176:VAL:HG12	14:b:178:LEU:HD13	1.98	0.44
9:I:10:ILE:HG21	9:I:141:ALA:HB3	1.99	0.44
3:C:201:VAL:O	3:C:202:GLN:HB3	2.17	0.44
8:H:112:SER:HB3	8:H:125:LEU:HD13	1.99	0.44
8:V:112:SER:HB3	8:V:125:LEU:HD13	1.99	0.44
11:Y:88:LEU:CD1	11:Y:118:GLY:HA3	2.47	0.44
11:Y:104:TRP:CE2	11:Y:181:GLU:HB3	2.53	0.44
3:C:35:LYS:HG2	3:C:158:SER:O	2.18	0.44
11:K:88:LEU:CD1	11:K:118:GLY:HA3	2.48	0.44
9:W:9:GLY:HA3	9:W:41:LYS:HE2	2.00	0.44
10:X:148:TYR:O	10:X:149:ARG:HD3	2.18	0.44
11:K:104:TRP:CE2	11:K:181:GLU:HB3	2.53	0.43
1:O:23:TYR:CD1	7:U:12:PRO:HA	2.53	0.43
1:O:122:THR:HG22	2:P:128:ARG:HH21	1.83	0.43
14:b:21:THR:O	17:b:201:BO2:H3	2.18	0.43
3:Q:35:LYS:HG2	3:Q:158:SER:O	2.19	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:R:89:VAL:HG12	11:Y:61:LYS:HG3	2.01	0.43
9:I:126:ILE:HG21	9:I:126:ILE:HD13	0.90	0.42
3:Q:149:GLU:HB2	3:Q:150:PRO:HD2	2.01	0.42
7:U:78:ILE:N	7:U:79:PRO:CD	2.82	0.42
9:I:9:GLY:HA3	9:I:41:LYS:HE2	1.99	0.42
12:L:8:ASN:HA	12:L:30:ILE:O	2.20	0.42
1:A:122:THR:HG22	2:B:128:ARG:HH21	1.84	0.42
9:W:20:VAL:HG13	9:W:118:PRO:HB3	2.01	0.42
7:G:78:ILE:N	7:G:79:PRO:CD	2.82	0.42
3:C:149:GLU:HB2	3:C:150:PRO:HD2	2.02	0.42
9:I:20:VAL:HG13	9:I:118:PRO:HB3	2.01	0.42
5:S:12:PHE:H	6:T:19:GLN:HE22	1.68	0.42
7:U:149:ASP:HB2	7:U:150:PRO:CD	2.50	0.42
9:W:20:VAL:HG23	9:W:189:ILE:HB	2.01	0.42
7:G:149:ASP:HB2	7:G:150:PRO:CD	2.50	0.42
8:H:84:LYS:HE2	8:H:119:THR:HG23	2.02	0.41
12:Z:8:ASN:HA	12:Z:30:ILE:O	2.20	0.41
8:H:113:ILE:HG21	8:H:113:ILE:HD13	1.75	0.41
9:I:20:VAL:HG23	9:I:189:ILE:HB	2.01	0.41
10:X:55:GLN:HE21	10:X:98:TYR:HE1	1.68	0.41
4:D:89:VAL:HG12	11:K:61:LYS:HG3	2.02	0.41
8:V:84:LYS:HE2	8:V:119:THR:HG23	2.03	0.41
12:Z:100:ARG:HD3	12:Z:105:TYR:CZ	2.56	0.41
2:B:221:ASP:O	2:B:223:GLU:N	2.54	0.41
9:W:26:LEU:HD21	9:W:185:VAL:HG23	2.03	0.41
2:P:221:ASP:O	2:P:223:GLU:N	2.54	0.41
5:S:77:ALA:N	5:S:78:PRO:CD	2.84	0.41
9:I:26:LEU:HD21	9:I:185:VAL:HG23	2.03	0.41
1:O:14:PRO:HA	2:P:23:TYR:CD1	2.56	0.41
4:D:160:ASN:HB3	4:D:179:TRP:CE2	2.56	0.41
5:E:77:ALA:N	5:E:78:PRO:CD	2.84	0.41
12:L:124:SER:HB3	12:L:134:GLU:OE2	2.21	0.40
10:J:3:ILE:HG22	10:J:18:SER:CB	2.51	0.40
4:D:91:HIS:HB3	4:D:99:ILE:CG2	2.52	0.40
13:M:127:LEU:HG	13:M:142:LEU:HD12	2.04	0.40
10:J:55:GLN:HE21	10:J:98:TYR:HE1	1.69	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	248/250 (99%)	239 (96%)	8 (3%)	1 (0%)	30	60
1	O	248/250 (99%)	239 (96%)	8 (3%)	1 (0%)	30	60
2	B	242/258 (94%)	235 (97%)	3 (1%)	4 (2%)	7	25
2	P	242/258 (94%)	235 (97%)	3 (1%)	4 (2%)	7	25
3	C	238/254 (94%)	233 (98%)	3 (1%)	2 (1%)	16	44
3	Q	238/254 (94%)	233 (98%)	3 (1%)	2 (1%)	16	44
4	D	231/260 (89%)	227 (98%)	4 (2%)	0	100	100
4	R	231/260 (89%)	227 (98%)	4 (2%)	0	100	100
5	E	229/234 (98%)	221 (96%)	8 (4%)	0	100	100
5	S	229/234 (98%)	223 (97%)	6 (3%)	0	100	100
6	F	241/288 (84%)	238 (99%)	3 (1%)	0	100	100
6	T	241/288 (84%)	238 (99%)	3 (1%)	0	100	100
7	G	239/252 (95%)	237 (99%)	2 (1%)	0	100	100
7	U	239/252 (95%)	237 (99%)	2 (1%)	0	100	100
8	H	224/232 (97%)	220 (98%)	4 (2%)	0	100	100
8	V	224/232 (97%)	220 (98%)	4 (2%)	0	100	100
9	I	202/205 (98%)	195 (96%)	7 (4%)	0	100	100
9	W	202/205 (98%)	195 (96%)	7 (4%)	0	100	100
10	J	193/198 (98%)	190 (98%)	3 (2%)	0	100	100
10	X	193/198 (98%)	190 (98%)	3 (2%)	0	100	100
11	K	209/211 (99%)	203 (97%)	6 (3%)	0	100	100
11	Y	209/211 (99%)	203 (97%)	6 (3%)	0	100	100
12	L	220/222 (99%)	215 (98%)	5 (2%)	0	100	100
12	Z	221/222 (100%)	216 (98%)	5 (2%)	0	100	100
13	M	231/246 (94%)	222 (96%)	9 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
13	a	231/246 (94%)	223 (96%)	8 (4%)	0	100	100
14	N	194/196 (99%)	188 (97%)	6 (3%)	0	100	100
14	b	194/196 (99%)	188 (97%)	6 (3%)	0	100	100
All	All	6283/6612 (95%)	6130 (98%)	139 (2%)	14 (0%)	43	72

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
3	Q	205	ALA
2	B	220	ASN
2	P	220	ASN

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%)	205 (98%)	4 (2%)	50	81
1	O	209/209 (100%)	205 (98%)	4 (2%)	50	81
2	B	203/216 (94%)	197 (97%)	6 (3%)	36	72
2	P	203/216 (94%)	197 (97%)	6 (3%)	36	72
3	C	212/226 (94%)	202 (95%)	10 (5%)	23	57
3	Q	212/226 (94%)	202 (95%)	10 (5%)	23	57

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
4	D	194/215 (90%)	183 (94%)	11 (6%)	18	49
4	R	194/215 (90%)	183 (94%)	11 (6%)	18	49
5	E	190/193 (98%)	184 (97%)	6 (3%)	34	70
5	S	190/193 (98%)	184 (97%)	6 (3%)	34	70
6	F	201/239 (84%)	195 (97%)	6 (3%)	36	72
6	T	201/239 (84%)	195 (97%)	6 (3%)	36	72
7	G	206/210 (98%)	199 (97%)	7 (3%)	32	68
7	U	206/210 (98%)	199 (97%)	7 (3%)	32	68
8	H	185/190 (97%)	178 (96%)	7 (4%)	29	64
8	V	185/190 (97%)	178 (96%)	7 (4%)	29	64
9	I	172/173 (99%)	169 (98%)	3 (2%)	53	83
9	W	172/173 (99%)	169 (98%)	3 (2%)	53	83
10	J	173/175 (99%)	170 (98%)	3 (2%)	53	83
10	X	173/175 (99%)	170 (98%)	3 (2%)	53	83
11	K	172/172 (100%)	165 (96%)	7 (4%)	27	62
11	Y	172/172 (100%)	165 (96%)	7 (4%)	27	62
12	L	186/186 (100%)	180 (97%)	6 (3%)	34	70
12	Z	187/186 (100%)	181 (97%)	6 (3%)	34	70
13	M	199/208 (96%)	194 (98%)	5 (2%)	42	76
13	a	199/208 (96%)	195 (98%)	4 (2%)	48	80
14	N	162/162 (100%)	157 (97%)	5 (3%)	35	70
14	b	162/162 (100%)	157 (97%)	5 (3%)	35	70
All	All	5329/5548 (96%)	5158 (97%)	171 (3%)	34	70

All (171) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	A	122	THR
1	A	157	PHE
1	A	250	LEU
2	B	55	LEU
2	B	79	LEU
2	B	102	ASN

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Mol	Chain	Res	Type
2	B	113	ARG
2	B	191	LEU
2	B	238	LEU
3	C	4	ARG
3	C	38	ASN
3	C	51	LYS
3	C	98	LEU
3	C	147	GLN
3	C	160	GLN
3	C	169	VAL
3	C	180	LYS
3	C	213	VAL
3	C	240	GLU
4	D	20	LEU
4	D	40	LEU
4	D	51	LEU
4	D	99	ILE
4	D	125	LEU
4	D	176	LEU
4	D	193	LEU
4	D	214	ILE
4	D	235	LEU
4	D	236	LYS
4	D	242	GLU
5	E	9	THR
5	E	29	LYS
5	E	55	LEU
5	E	71	LEU
5	E	188	LEU
5	E	231	LYS
6	F	123	ASN
6	F	172	LEU
6	F	181	GLU
6	F	201	GLU
6	F	221	ASN
6	F	240	GLN
7	G	26	THR
7	G	75	ASN
7	G	115	LEU
7	G	122	ARG
7	G	125	MET
7	G	235	ARG

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Mol	Chain	Res	Type
7	G	236	LEU
8	H	22	GLN
8	H	34	LEU
8	H	56	THR
8	H	68	LEU
8	H	113	ILE
8	H	127	LEU
8	H	196	ARG
9	I	37	ASN
9	I	126	ILE
9	I	171	LEU
10	J	1	MET
10	J	3	ILE
10	J	99	GLN
11	K	4	LEU
11	K	12	VAL
11	K	21	THR
11	K	30	ARG
11	K	73	ARG
11	K	88	LEU
11	K	147	LEU
12	L	23	LEU
12	L	49	ASN
12	L	124	SER
12	L	128	VAL
12	L	132	GLN
12	L	150	LEU
13	M	2	GLN
13	M	35	ARG
13	M	48	ASN
13	M	70	LEU
13	M	104	ARG
14	N	9	LYS
14	N	35	THR
14	N	104	ASP
14	N	119	VAL
14	N	178	LEU
1	O	1	MET
1	O	122	THR
1	O	157	PHE
1	O	250	LEU
2	P	55	LEU

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Mol	Chain	Res	Type
2	P	79	LEU
2	P	102	ASN
2	P	113	ARG
2	P	191	LEU
2	P	238	LEU
3	Q	4	ARG
3	Q	38	ASN
3	Q	51	LYS
3	Q	98	LEU
3	Q	147	GLN
3	Q	160	GLN
3	Q	169	VAL
3	Q	180	LYS
3	Q	213	VAL
3	Q	240	GLU
4	R	20	LEU
4	R	40	LEU
4	R	51	LEU
4	R	99	ILE
4	R	125	LEU
4	R	176	LEU
4	R	193	LEU
4	R	214	ILE
4	R	235	LEU
4	R	236	LYS
4	R	242	GLU
5	S	9	THR
5	S	29	LYS
5	S	55	LEU
5	S	71	LEU
5	S	188	LEU
5	S	231	LYS
6	T	123	ASN
6	T	172	LEU
6	T	181	GLU
6	T	201	GLU
6	T	221	ASN
6	T	240	GLN
7	U	26	THR
7	U	75	ASN
7	U	115	LEU
7	U	122	ARG

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Mol	Chain	Res	Type
7	U	125	MET
7	U	235	ARG
7	U	236	LEU
8	V	22	GLN
8	V	34	LEU
8	V	56	THR
8	V	68	LEU
8	V	113	ILE
8	V	127	LEU
8	V	196	ARG
9	W	37	ASN
9	W	126	ILE
9	W	171	LEU
10	X	1	MET
10	X	3	ILE
10	X	99	GLN
11	Y	4	LEU
11	Y	12	VAL
11	Y	21	THR
11	Y	30	ARG
11	Y	88	LEU
11	Y	99	SER
11	Y	147	LEU
12	Z	23	LEU
12	Z	49	ASN
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
14	b	9	LYS
14	b	35	THR
14	b	104	ASP
14	b	119	VAL
14	b	178	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (110) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	124	HIS
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	100	ASN
4	D	180	HIS
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	123	ASN
7	G	114	ASN
7	G	117	GLN
7	G	121	GLN
7	G	172	ASN
7	G	175	ASN
8	H	30	ASN
8	H	165	ASN
8	H	189	ASN
9	I	63	ASN
9	I	88	GLN
9	I	203	GLN
10	J	10	GLN
10	J	55	GLN
10	J	63	ASN
11	K	32	ASN
11	K	85	ASN
11	K	142	ASN
11	K	175	ASN
12	L	3	ASN
12	L	29	ASN

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Mol	Chain	Res	Type
12	L	36	ASN
12	L	49	ASN
12	L	70	ASN
12	L	79	HIS
12	L	80	ASN
12	L	158	ASN
12	L	197	GLN
13	M	48	ASN
13	M	108	ASN
14	N	38	HIS
14	N	141	ASN
2	P	124	HIS
2	P	176	GLN
3	Q	17	GLN
3	Q	116	GLN
3	Q	120	GLN
3	Q	147	GLN
3	Q	160	GLN
4	R	15	GLN
4	R	91	HIS
4	R	100	ASN
4	R	225	ASN
5	S	68	HIS
5	S	92	ASN
5	S	99	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
7	U	83	ASN
7	U	114	ASN
7	U	117	GLN
7	U	121	GLN
7	U	172	ASN
7	U	175	ASN
8	V	30	ASN
8	V	57	GLN
8	V	189	ASN
8	V	200	GLN

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Mol	Chain	Res	Type
9	W	63	ASN
9	W	203	GLN
10	X	10	GLN
10	X	55	GLN
10	X	63	ASN
10	X	147	HIS
11	Y	32	ASN
11	Y	85	ASN
11	Y	142	ASN
11	Y	175	ASN
12	Z	3	ASN
12	Z	29	ASN
12	Z	36	ASN
12	Z	49	ASN
12	Z	70	ASN
12	Z	79	HIS
12	Z	80	ASN
12	Z	158	ASN
12	Z	197	GLN
13	a	48	ASN
13	a	108	ASN
13	a	149	HIS
14	b	38	HIS
14	b	141	ASN
14	b	161	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

Of 17 ligands modelled in this entry, 11 are monoatomic - leaving 6 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	BO2	Y	301	11	25,29,29	1.56	5 (20%)	33,38,38	1.29	4 (12%)
17	BO2	K	301	11	25,29,29	1.58	5 (20%)	33,38,38	1.29	4 (12%)
17	BO2	N	201	14	25,29,29	1.55	5 (20%)	33,38,38	1.31	6 (18%)
17	BO2	V	301	8	25,29,29	1.58	5 (20%)	33,38,38	1.37	5 (15%)
17	BO2	H	301	8	25,29,29	1.59	5 (20%)	33,38,38	1.35	5 (15%)
17	BO2	b	201	14	25,29,29	1.56	5 (20%)	33,38,38	1.33	5 (15%)

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	BO2	Y	301	11	-	0/23/28/28	0/2/2/2
17	BO2	K	301	11	-	0/23/28/28	0/2/2/2
17	BO2	N	201	14	-	4/23/28/28	0/2/2/2
17	BO2	V	301	8	-	4/23/28/28	0/2/2/2
17	BO2	H	301	8	-	4/23/28/28	0/2/2/2
17	BO2	b	201	14	-	4/23/28/28	0/2/2/2

All (30) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
17	b	201	BO2	C11-C12	-4.20	1.41	1.51
17	H	301	BO2	C11-C12	-4.19	1.41	1.51
17	V	301	BO2	C11-C12	-4.08	1.41	1.51
17	N	201	BO2	C11-C12	-4.07	1.41	1.51
17	H	301	BO2	C2-C7	-3.89	1.39	1.50
17	V	301	BO2	C2-C7	-3.87	1.39	1.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
17	Y	301	BO2	C2-C7	-3.84	1.40	1.50
17	K	301	BO2	C11-C12	-3.83	1.42	1.51
17	Y	301	BO2	C11-C12	-3.80	1.42	1.51
17	K	301	BO2	C2-C7	-3.79	1.40	1.50
17	N	201	BO2	C2-C7	-3.79	1.40	1.50
17	b	201	BO2	C2-C7	-3.75	1.40	1.50
17	K	301	BO2	C3-N4	3.19	1.41	1.34
17	Y	301	BO2	C3-N4	3.16	1.41	1.34
17	V	301	BO2	C6-N1	3.12	1.41	1.34
17	H	301	BO2	C6-N1	3.11	1.41	1.34
17	b	201	BO2	C6-N1	3.08	1.41	1.34
17	K	301	BO2	C6-N1	3.08	1.41	1.34
17	H	301	BO2	C3-N4	3.04	1.40	1.34
17	Y	301	BO2	C6-N1	3.02	1.40	1.34
17	N	201	BO2	C6-N1	3.01	1.40	1.34
17	V	301	BO2	C3-N4	3.01	1.40	1.34
17	N	201	BO2	C3-N4	2.73	1.40	1.34
17	b	201	BO2	C3-N4	2.70	1.40	1.34
17	Y	301	BO2	C5-N4	2.48	1.40	1.33
17	K	301	BO2	C5-N4	2.48	1.40	1.33
17	V	301	BO2	C5-N4	2.35	1.40	1.33
17	H	301	BO2	C5-N4	2.27	1.40	1.33
17	b	201	BO2	C5-N4	2.12	1.39	1.33
17	N	201	BO2	C5-N4	2.12	1.39	1.33

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
17	V	301	BO2	C21-C22-C23	-3.84	110.42	115.32
17	H	301	BO2	C21-C22-C23	-3.69	110.61	115.32
17	N	201	BO2	C21-C22-C23	-3.66	110.65	115.32
17	b	201	BO2	C21-C22-C23	-3.66	110.65	115.32
17	K	301	BO2	C6-N1-C2	3.58	121.54	116.93
17	Y	301	BO2	C6-N1-C2	3.57	121.53	116.93
17	V	301	BO2	C6-N1-C2	3.43	121.36	116.93
17	H	301	BO2	C6-N1-C2	3.37	121.27	116.93
17	K	301	BO2	C21-C22-C23	-3.23	111.19	115.32
17	Y	301	BO2	C21-C22-C23	-3.22	111.21	115.32
17	b	201	BO2	C6-N1-C2	3.08	120.90	116.93
17	N	201	BO2	C6-N1-C2	3.07	120.88	116.93
17	b	201	BO2	C11-C10-N9	-2.45	105.76	110.83
17	N	201	BO2	C11-C10-N9	-2.37	105.93	110.83

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
17	H	301	BO2	C6-C5-N4	-2.36	119.03	121.96
17	V	301	BO2	C6-C5-N4	-2.36	119.03	121.96
17	H	301	BO2	B26-C21-C22	-2.33	107.91	112.31
17	Y	301	BO2	C6-C5-N4	-2.31	119.09	121.96
17	V	301	BO2	B26-C21-C22	-2.30	107.97	112.31
17	K	301	BO2	C6-C5-N4	-2.23	119.18	121.96
17	K	301	BO2	B26-C21-C22	-2.17	108.21	112.31
17	Y	301	BO2	B26-C21-C22	-2.14	108.27	112.31
17	b	201	BO2	B26-C21-C22	-2.14	108.28	112.31
17	H	301	BO2	C12-C11-C10	-2.13	107.69	113.36
17	b	201	BO2	C6-C5-N4	-2.12	119.32	121.96
17	V	301	BO2	C12-C11-C10	-2.10	107.77	113.36
17	N	201	BO2	B26-C21-C22	-2.10	108.36	112.31
17	N	201	BO2	C6-C5-N4	-2.06	119.40	121.96
17	N	201	BO2	C7-C2-N1	2.03	119.80	117.42

There are no chirality outliers.

All (16) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
17	H	301	BO2	C3-C2-C7-O8
17	H	301	BO2	C3-C2-C7-N9
17	V	301	BO2	C3-C2-C7-O8
17	V	301	BO2	C3-C2-C7-N9
17	H	301	BO2	N1-C2-C7-O8
17	V	301	BO2	N1-C2-C7-O8
17	V	301	BO2	N1-C2-C7-N9
17	H	301	BO2	N1-C2-C7-N9
17	N	201	BO2	N1-C2-C7-N9
17	b	201	BO2	N1-C2-C7-N9
17	N	201	BO2	N1-C2-C7-O8
17	b	201	BO2	N1-C2-C7-O8
17	N	201	BO2	C3-C2-C7-O8
17	b	201	BO2	C3-C2-C7-O8
17	N	201	BO2	C3-C2-C7-N9
17	b	201	BO2	C3-C2-C7-N9

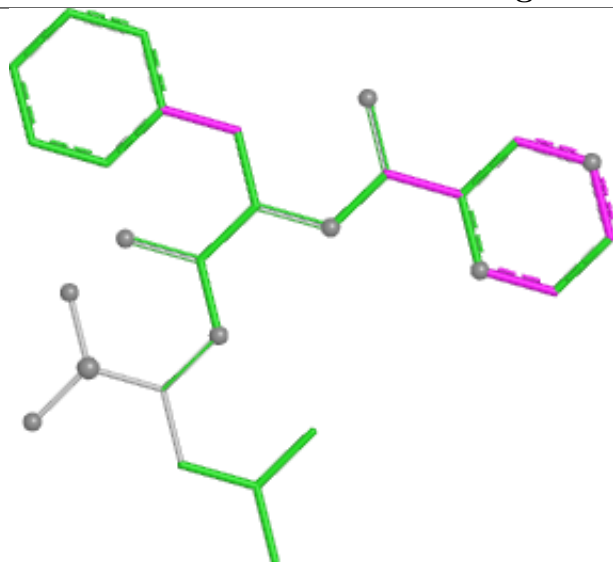
There are no ring outliers.

2 monomers are involved in 2 short contacts:

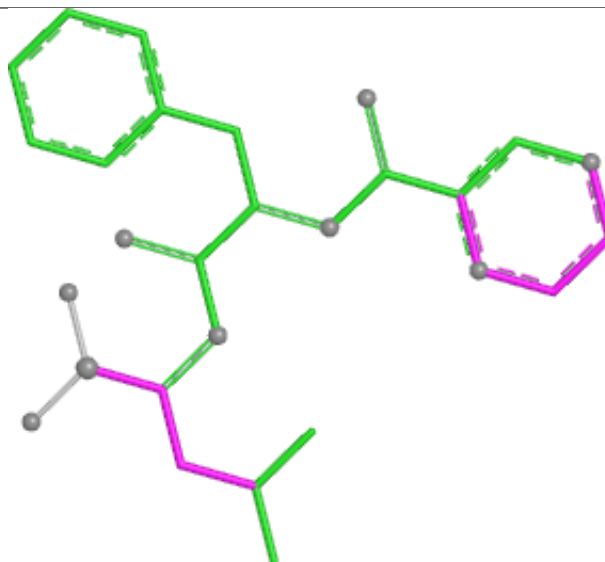
Mol	Chain	Res	Type	Clashes	Symm-Clashes
17	N	201	BO2	1	0
17	b	201	BO2	1	0

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.

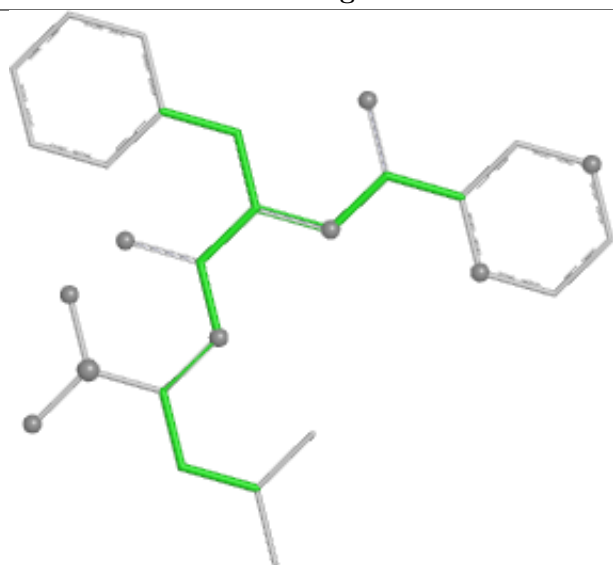
Ligand BO2 Y 301



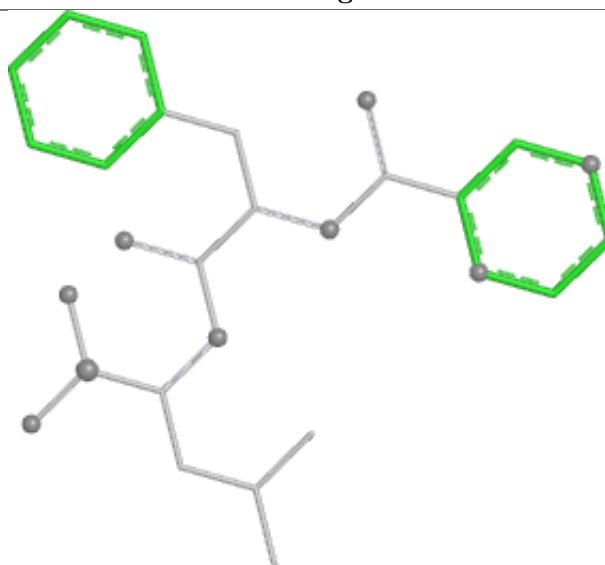
Bond lengths



Bond angles

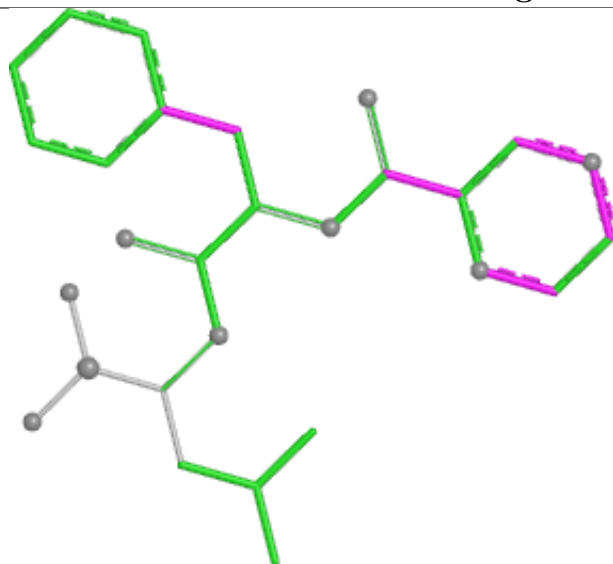


Torsions

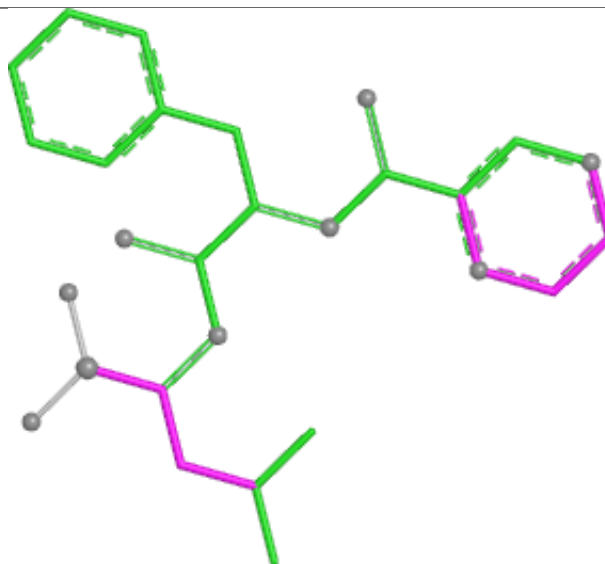


Rings

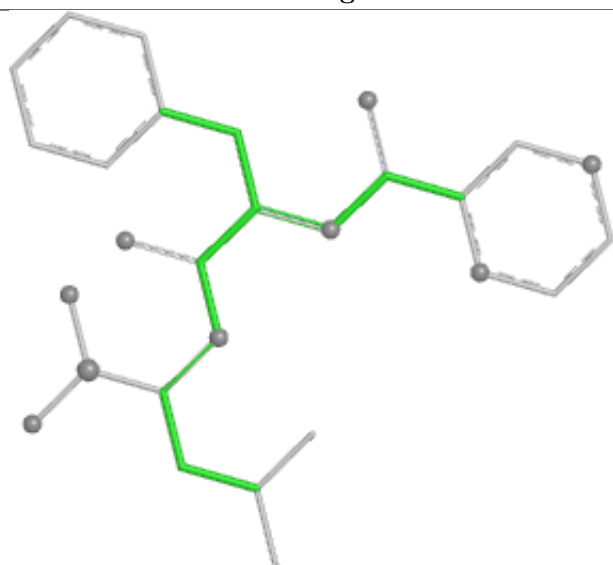
Ligand BO2 K 301



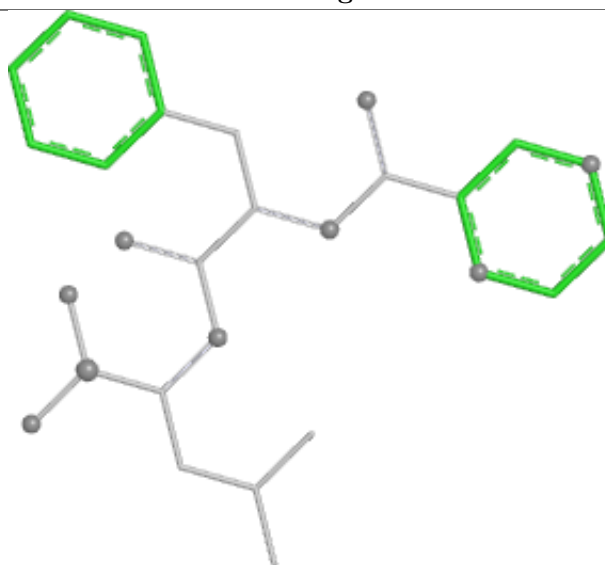
Bond lengths



Bond angles

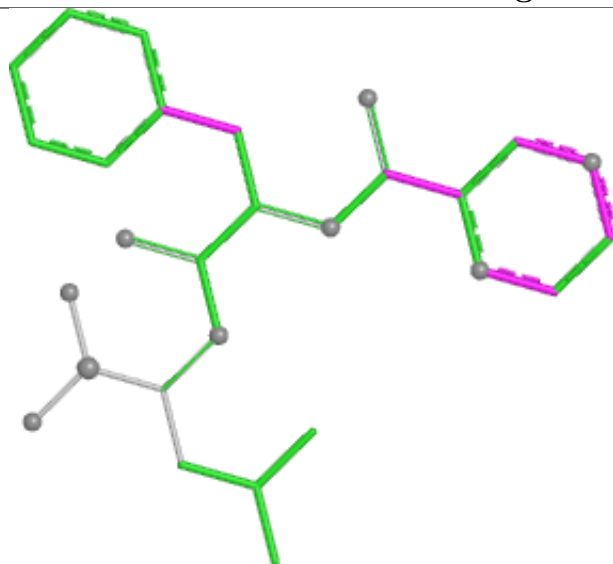


Torsions

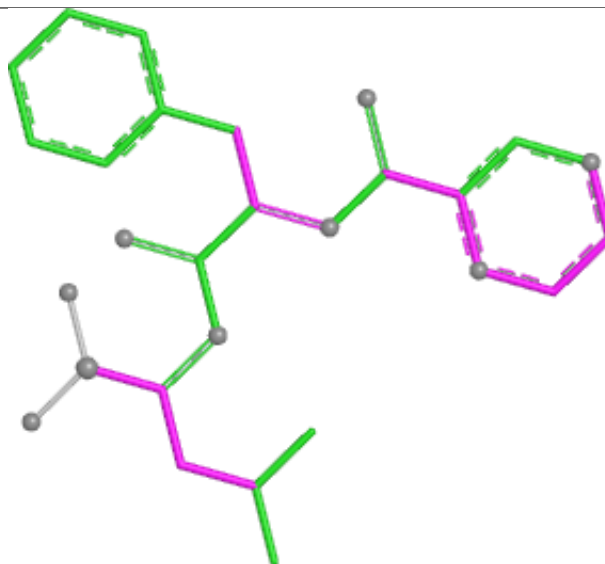


Rings

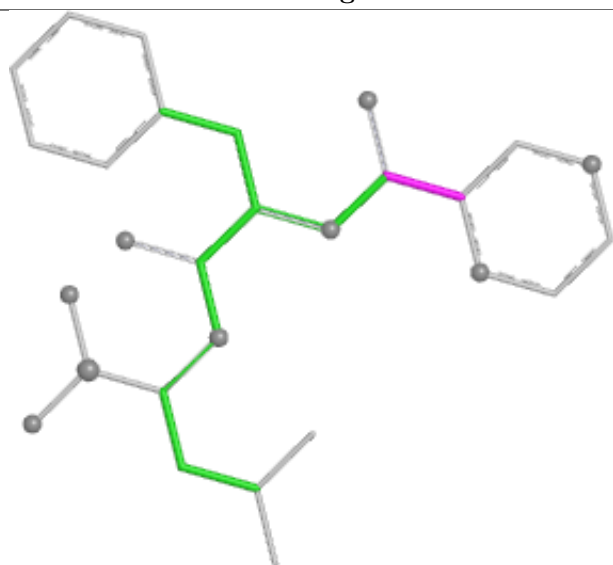
Ligand BO2 N 201



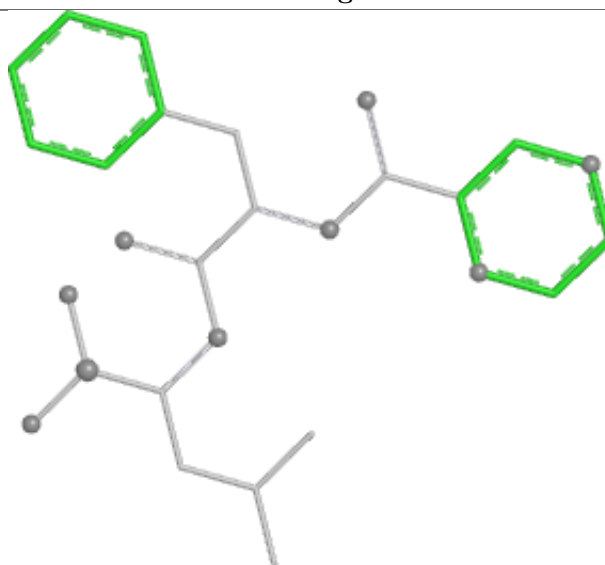
Bond lengths



Bond angles

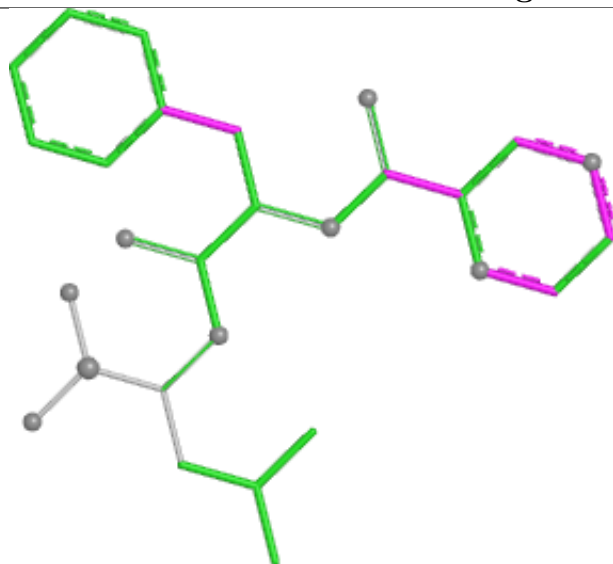


Torsions

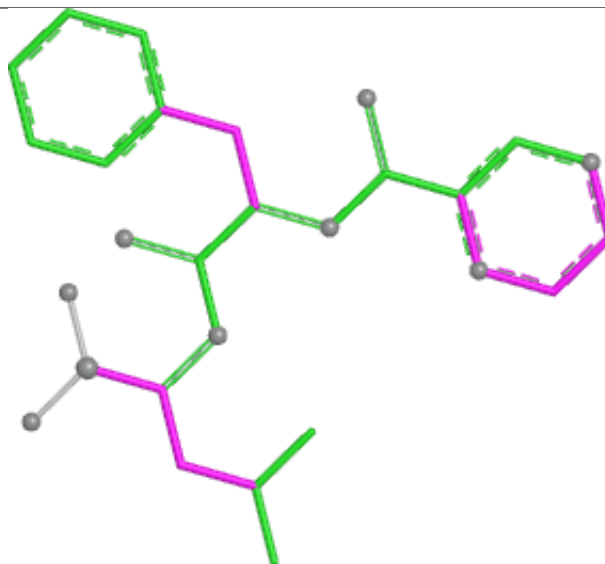


Rings

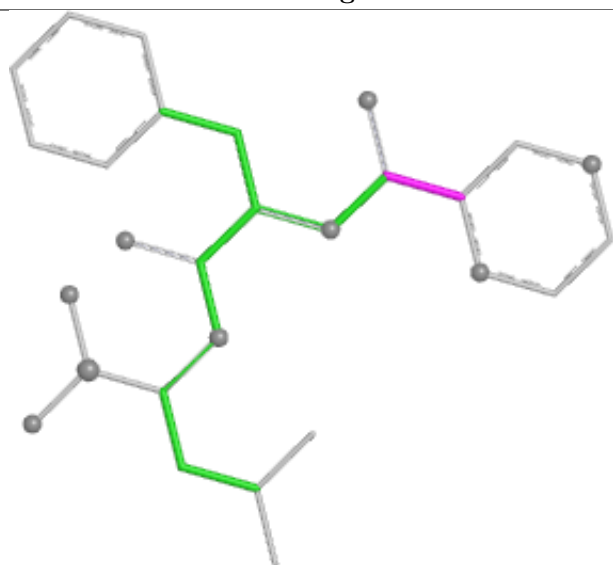
Ligand BO2 V 301



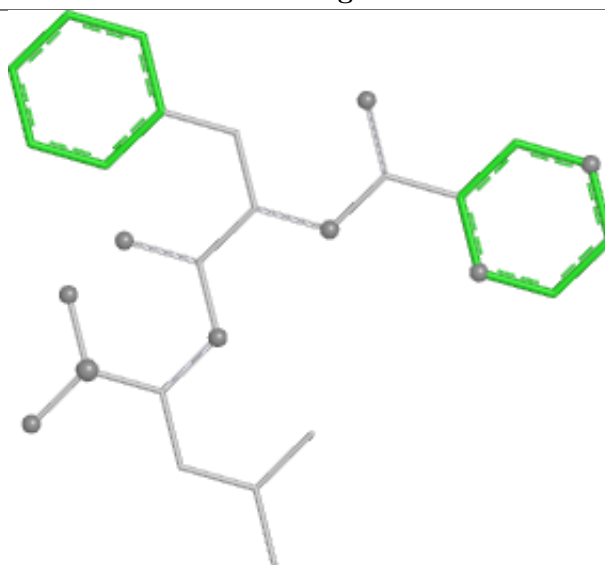
Bond lengths



Bond angles

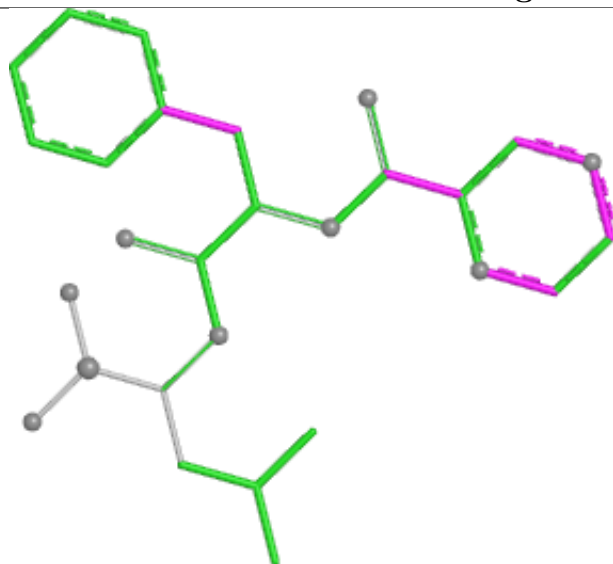


Torsions

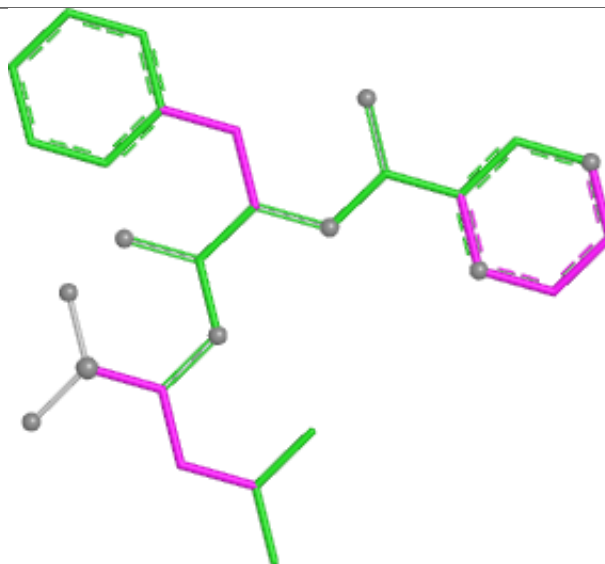


Rings

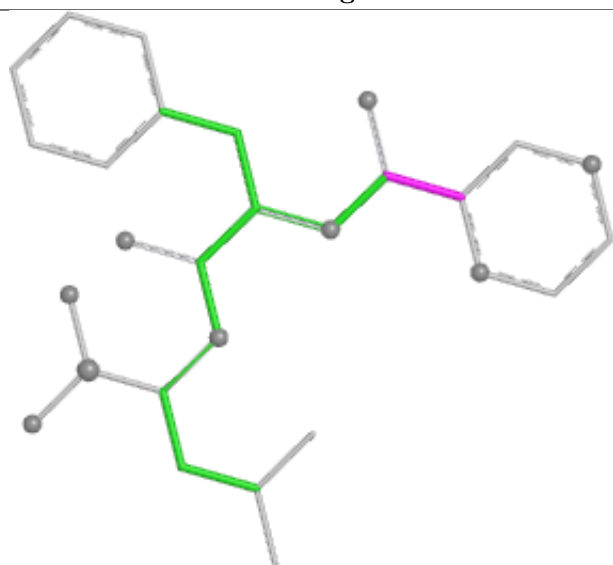
Ligand BO2 H 301



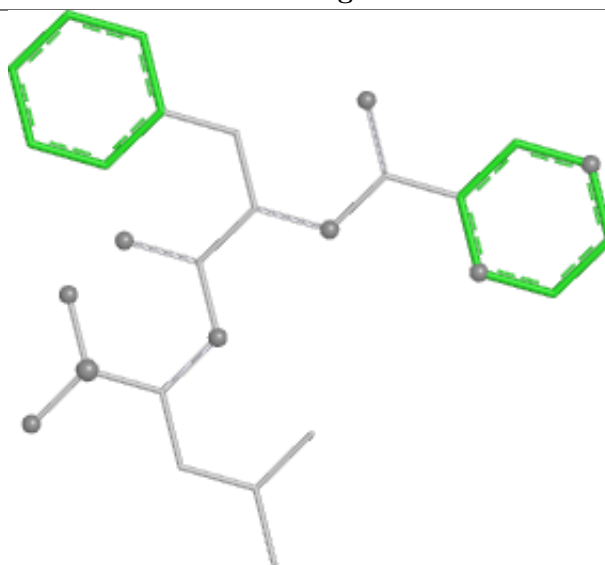
Bond lengths



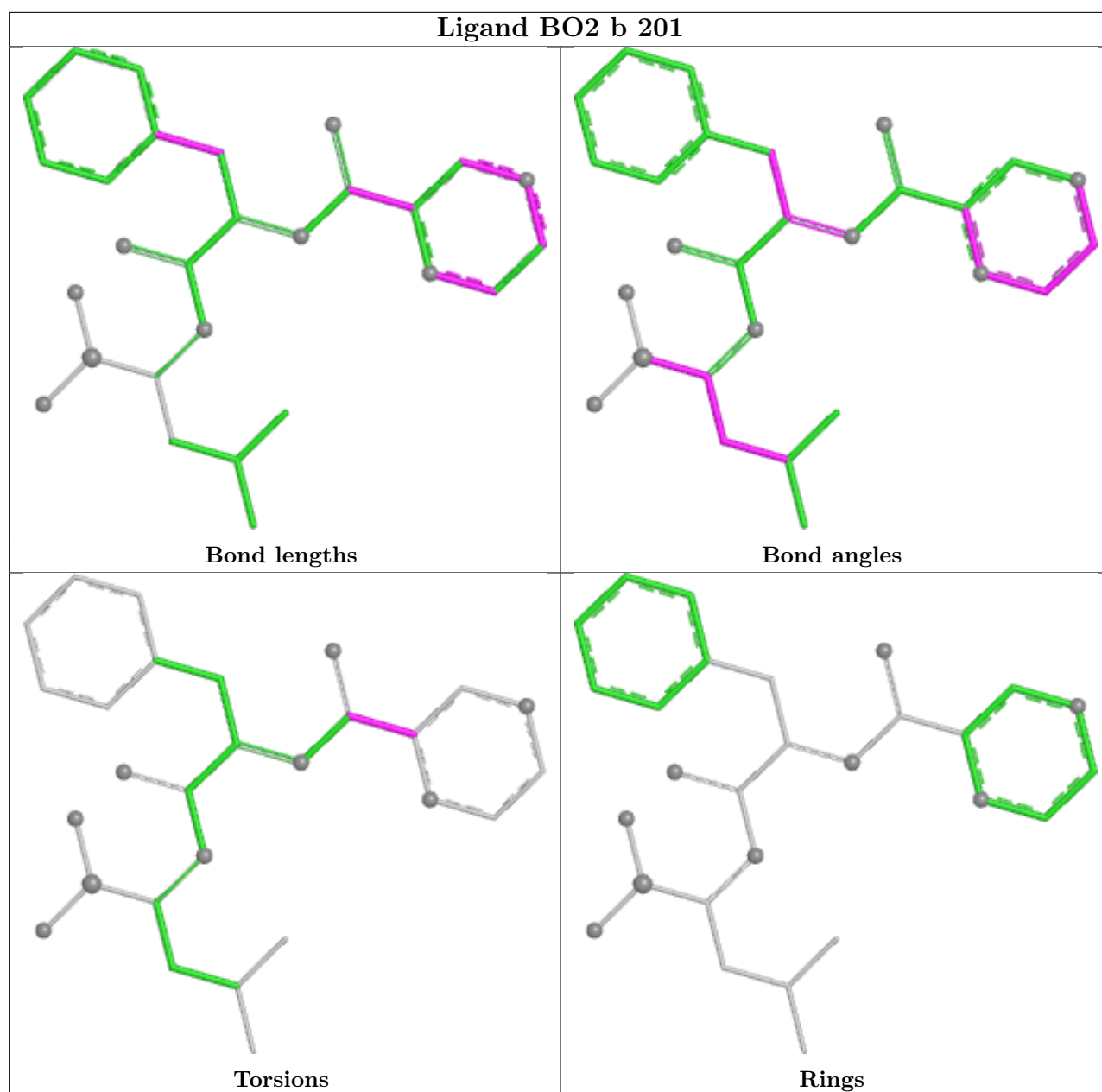
Bond angles



Torsions



Rings



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	250/250 (100%)	-0.44	2 (0%) 82 75	38, 55, 92, 128	0
1	O	250/250 (100%)	-0.45	1 (0%) 88 84	42, 59, 105, 138	0
2	B	244/258 (94%)	-0.22	2 (0%) 82 75	42, 62, 107, 161	0
2	P	244/258 (94%)	-0.33	2 (0%) 82 75	44, 63, 106, 155	0
3	C	240/254 (94%)	-0.10	8 (3%) 49 39	41, 68, 137, 175	0
3	Q	240/254 (94%)	-0.06	6 (2%) 58 48	32, 75, 152, 187	0
4	D	235/260 (90%)	-0.33	1 (0%) 88 84	48, 66, 97, 129	0
4	R	235/260 (90%)	-0.09	6 (2%) 57 47	55, 73, 113, 143	0
5	E	231/234 (98%)	-0.31	0 100 100	47, 67, 107, 152	0
5	S	231/234 (98%)	-0.17	2 (0%) 81 74	49, 71, 112, 143	0
6	F	243/288 (84%)	-0.41	2 (0%) 82 75	40, 61, 108, 135	0
6	T	243/288 (84%)	-0.30	6 (2%) 58 48	41, 67, 125, 151	0
7	G	241/252 (95%)	-0.47	0 100 100	39, 57, 96, 153	0
7	U	241/252 (95%)	-0.45	0 100 100	42, 57, 92, 135	0
8	H	226/232 (97%)	-0.48	1 (0%) 88 84	35, 52, 91, 150	0
8	V	226/232 (97%)	-0.48	2 (0%) 81 74	38, 52, 87, 163	0
9	I	204/205 (99%)	-0.60	0 100 100	37, 52, 80, 105	0
9	W	204/205 (99%)	-0.64	1 (0%) 87 82	39, 53, 80, 104	0
10	J	195/198 (98%)	-0.56	1 (0%) 87 82	39, 56, 82, 127	0
10	X	195/198 (98%)	-0.54	1 (0%) 87 82	41, 58, 83, 136	0
11	K	211/211 (100%)	-0.40	0 100 100	44, 60, 90, 113	0
11	Y	211/211 (100%)	-0.41	0 100 100	45, 61, 90, 118	0
12	L	222/222 (100%)	-0.33	2 (0%) 81 74	42, 59, 100, 130	0
12	Z	222/222 (100%)	-0.32	2 (0%) 81 74	33, 60, 102, 136	1 (0%)

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
13	M	233/246 (94%)	-0.56	2 (0%) 81 74	38, 53, 77, 96	0
13	a	233/246 (94%)	-0.51	2 (0%) 81 74	39, 56, 79, 96	0
14	N	196/196 (100%)	-0.63	0 100 100	35, 49, 79, 106	0
14	b	196/196 (100%)	-0.60	0 100 100	37, 50, 82, 110	0
All	All	6342/6612 (95%)	-0.39	52 (0%) 82 75	32, 60, 104, 187	1 (0%)

All (52) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
12	L	174	TYR	4.6
12	Z	174	TYR	4.6
10	X	1	MET	4.4
2	B	218	GLY	4.2
10	J	1	MET	3.7
2	P	51	VAL	3.7
8	V	223	ILE	3.4
6	F	215	CYS	3.3
4	R	116	GLY	3.2
4	R	113	LEU	3.1
2	B	219	ALA	3.0
8	H	223	ILE	2.9
13	a	1	THR	2.8
3	C	51	LYS	2.8
6	T	204	LYS	2.8
2	P	1	GLY	2.7
4	R	117	GLU	2.7
4	R	112	ALA	2.7
4	D	113	LEU	2.7
12	L	165	ASN	2.6
8	V	224	GLN	2.6
3	Q	205	ALA	2.6
3	Q	240	GLU	2.5
3	Q	50	LEU	2.5
13	M	1	THR	2.4
4	R	125	LEU	2.4
3	C	240	GLU	2.4
3	C	236	GLN	2.4
5	S	204	SER	2.4
6	T	14	ASP	2.3
9	W	1	SER	2.3
1	A	1	MET	2.3

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Mol	Chain	Res	Type	RSRZ
1	O	53	SER	2.3
4	R	114	ARG	2.3
13	a	69	ASP	2.2
3	Q	3	ASP	2.2
1	A	249	ALA	2.2
6	T	205	GLU	2.2
3	C	234	ILE	2.2
3	Q	51	LYS	2.1
13	M	69	ASP	2.1
3	C	205	ALA	2.1
3	C	186	VAL	2.1
3	C	238	LYS	2.1
5	S	96	LEU	2.1
6	F	202	ASP	2.1
6	T	243	ILE	2.1
12	Z	165	ASN	2.0
3	Q	175	LYS	2.0
6	T	178	HIS	2.0
6	T	215	CYS	2.0
3	C	203	THR	2.0

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
17	BO2	N	201	28/28	0.88	0.13	33,48,59,61	0
15	MG	Z	301	1/1	0.89	0.08	66,66,66,66	0
17	BO2	Y	301	28/28	0.89	0.12	43,52,66,69	0

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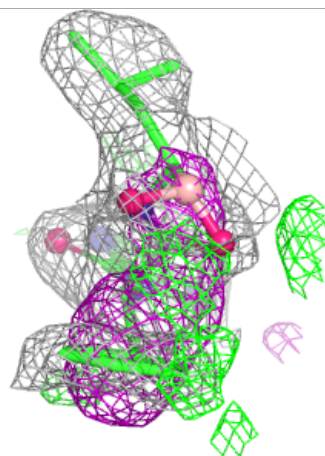
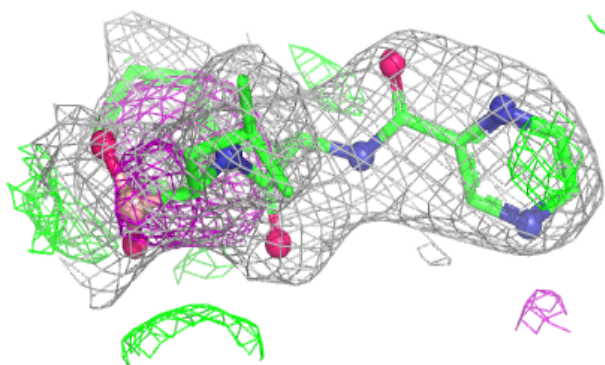
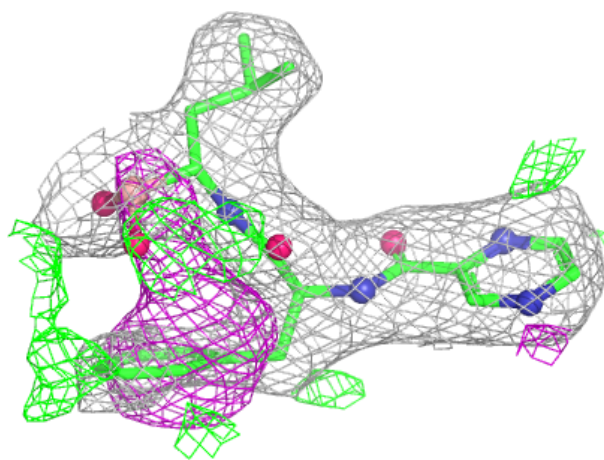
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
17	BO2	b	201	28/28	0.91	0.11	37,48,60,61	0
17	BO2	K	301	28/28	0.92	0.10	38,47,61,61	0
17	BO2	V	301	28/28	0.93	0.10	44,48,68,70	0
17	BO2	H	301	28/28	0.94	0.09	42,48,64,67	0
16	CL	G	302	1/1	0.96	0.09	41,41,41,41	0
16	CL	b	202	1/1	0.97	0.05	56,56,56,56	0
16	CL	U	301	1/1	0.98	0.10	44,44,44,44	0
15	MG	L	301	1/1	0.98	0.05	66,66,66,66	0
15	MG	N	202	1/1	0.99	0.03	49,49,49,49	0
15	MG	I	301	1/1	0.99	0.04	55,55,55,55	0
15	MG	J	201	1/1	0.99	0.03	50,50,50,50	0
16	CL	N	203	1/1	0.99	0.04	51,51,51,51	0
15	MG	K	302	1/1	0.99	0.07	56,56,56,56	0
15	MG	G	301	1/1	0.99	0.02	59,59,59,59	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.

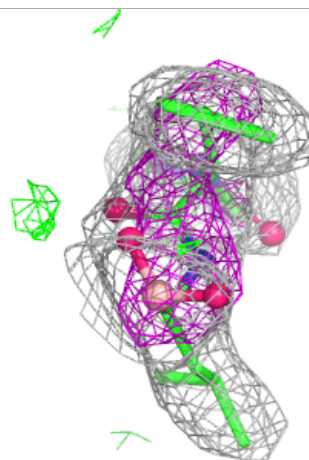
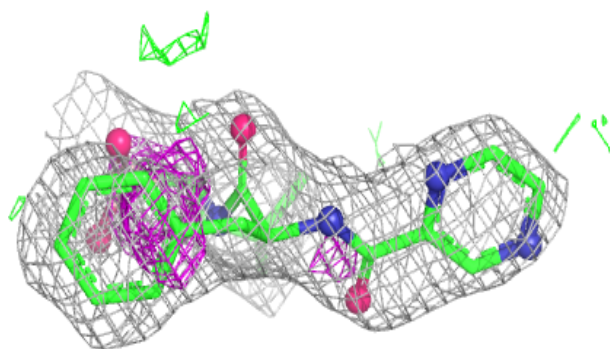
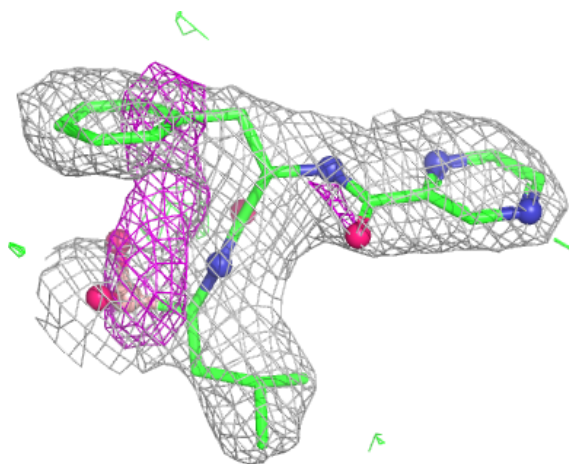
Electron density around BO2 N 201:

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



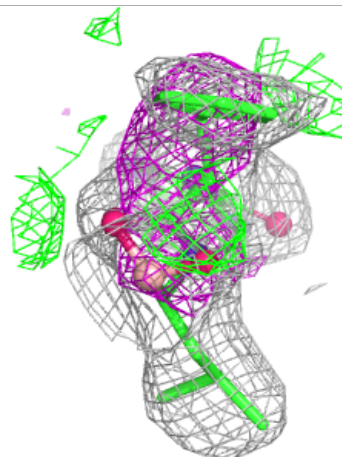
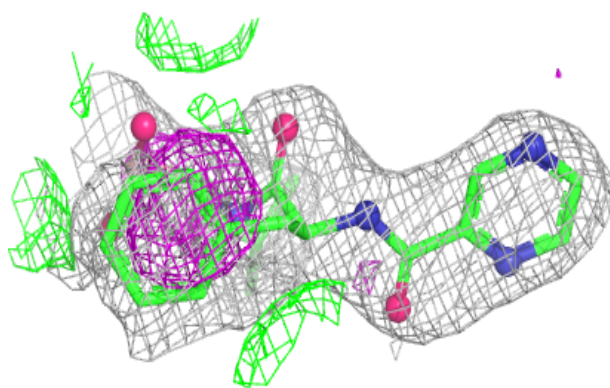
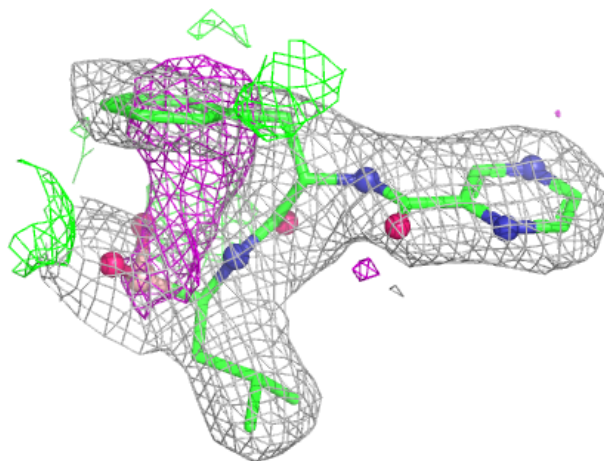
Electron density around BO2 Y 301:

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



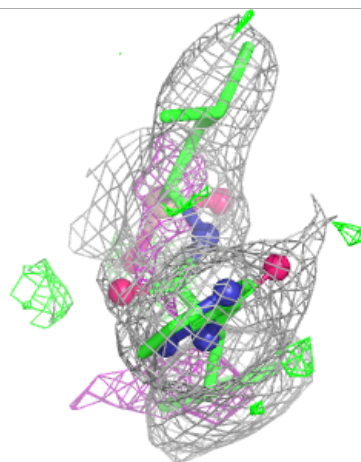
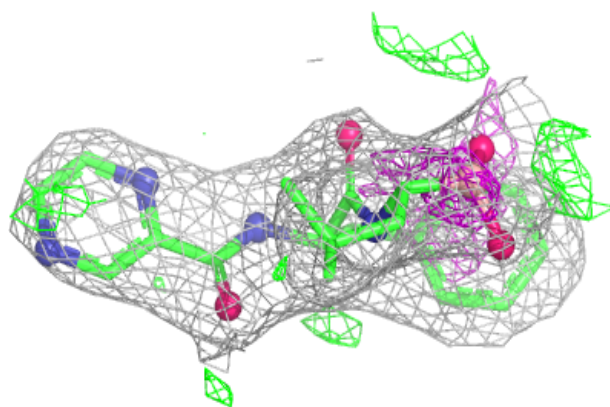
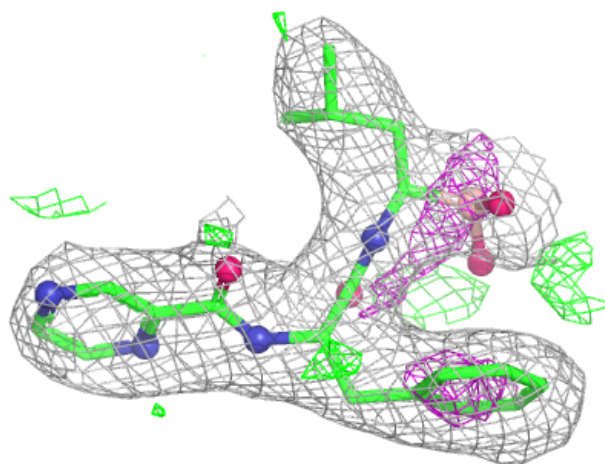
Electron density around BO2 b 201:

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



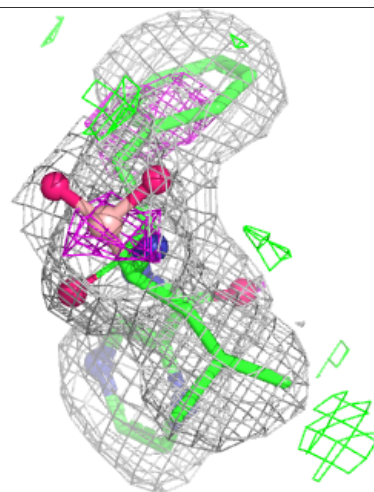
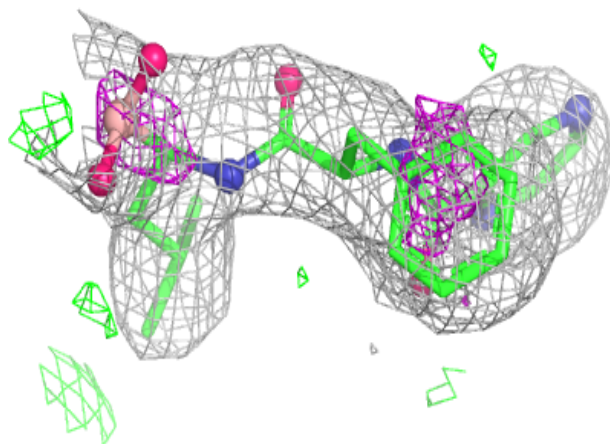
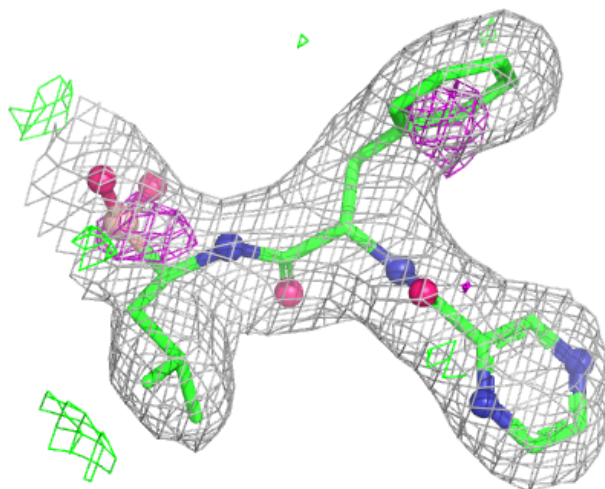
Electron density around BO2 K 301:

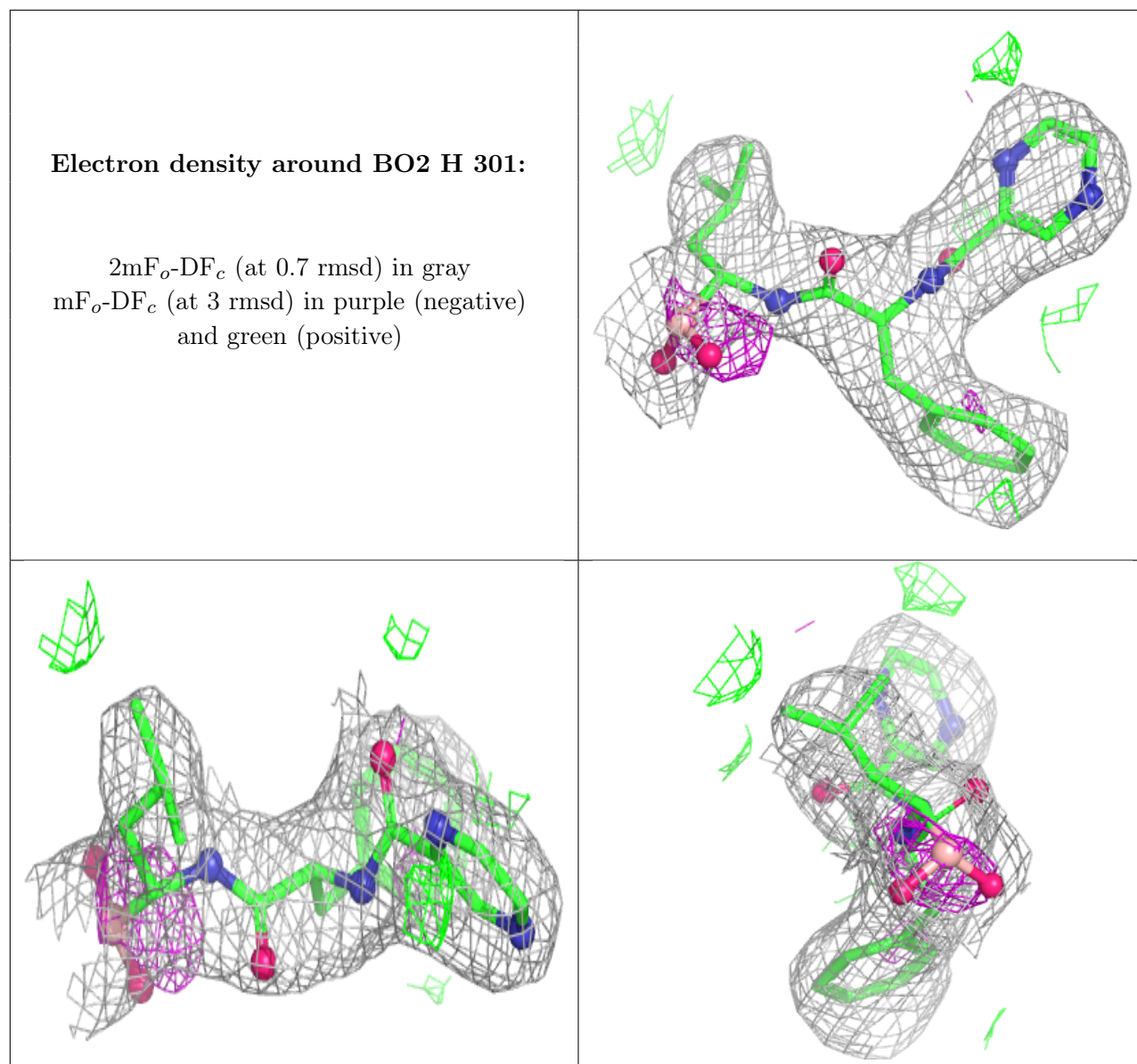
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around BO2 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)





6.5 Other polymers ⓘ

There are no such residues in this entry.