



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 10:43 AM UTC

PDB ID : 8OLR / pdb_00008olr
Title : Structure of yeast 20S proteasome in complex with the natural product beta-lactone inhibitor Cystargolide A
Authors : Illigmann, A.; Vielberg, M.-T.; Lakemeyer, M.; Wolf, F.; Staudt, N.; Dema, T.; Stange, P.; Malik, I.; Grond, S.; Sieber, S.A.; Groll, M.; Kaysser, L.; Broetz-Oesterhelt, H.
Deposited on : 2023-03-30
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](#) ①) 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

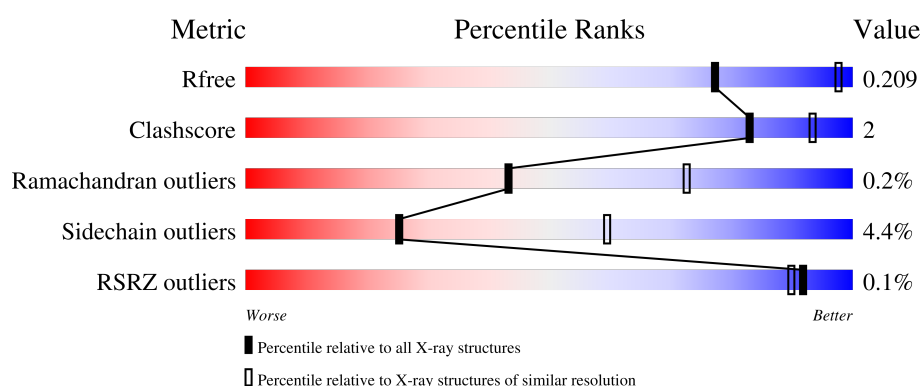
1 Overall quality at a glance

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	97% .
1	O	250	96% .
2	B	258	86% 9% 5%
2	P	258	87% 7% 5%
3	C	254	87% 6% . 6%

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Mol	Chain	Length	Quality of chain
3	Q	254	 87% 6% • 6%
4	D	260	 84% 5% • 10%
4	R	260	 85% 5% 10%
5	E	234	 93% 5% ..
5	S	234	 92% 6% .
6	F	288	 81% .. 16%
6	T	288	 80% .. 16%
7	G	252	 90% 6% .
7	U	252	 87% 8% ..
8	H	232	 86% 9% ..
8	V	232	 86% 9% ..
9	I	205	 93% 6%
9	W	205	 92% 7%
10	J	198	 93% 5% ..
10	X	198	 93% 5% ..
11	K	212	 89% 10% .
11	Y	212	 87% 11% .
12	L	222	 91% 8% .
12	Z	222	 91% 8% .
13	M	246	 87% 7% • 5%
13	a	246	 85% 9% • 5%
14	N	196	 83% 16% .
14	b	196	 84% 15% .

2 Entry composition

There are 18 unique types of molecules in this entry. The entry contains 49760 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-5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
11	K	212	Total	C	N	O	S	0	0	0
			1644	1045	280	312	7			
11	Y	212	Total	C	N	O	S	0	0	0
			1644	1045	280	312	7			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
12	L	222	Total	C	N	O	S	0	0	0
			1757	1115	303	335	4			
12	Z	222	Total	C	N	O	S	0	0	0
			1757	1115	303	335	4			

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

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

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

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

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
15	G	1	Total	Mg	0	0
			1	1		
15	I	1	Total	Mg	0	0
			1	1		

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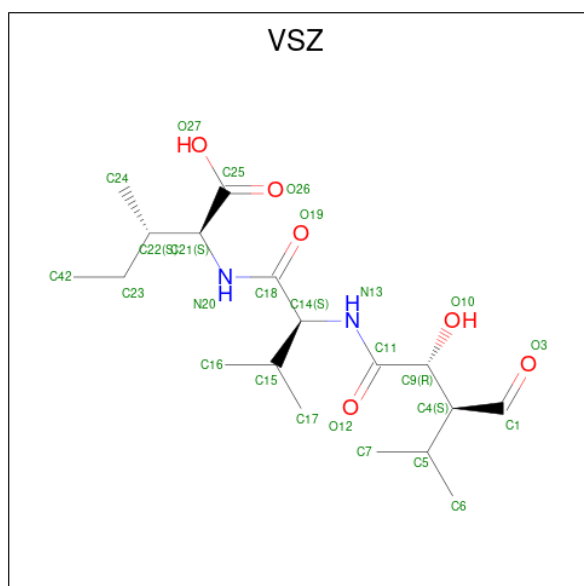
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
15	K	1	Total	Mg	0	0
			1	1		
15	N	1	Total	Mg	0	0
			1	1		
15	W	1	Total	Mg	0	0
			1	1		
15	Y	1	Total	Mg	0	0
			1	1		
15	Z	1	Total	Mg	0	0
			1	1		

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

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

- Molecule 17 is Cystargolide A (bound) (CCD ID: VSZ) (formula: C₁₈H₃₂N₂O₆) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
17	H	1	Total	C	N	O	0	0
			26	18	2	6		
17	K	1	Total	C	N	O	0	0
			26	18	2	6		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
17	N	1	Total	C	N	O	0	0
			26	18	2	6		
17	V	1	Total	C	N	O	0	0
			26	18	2	6		
17	Y	1	Total	C	N	O	0	0
			26	18	2	6		
17	b	1	Total	C	N	O	0	0
			26	18	2	6		

- Molecule 18 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
18	A	3	Total	O	0	0
			3	3		
18	B	10	Total	O	0	0
			10	10		
18	C	7	Total	O	0	0
			7	7		
18	D	3	Total	O	0	0
			3	3		
18	E	3	Total	O	0	0
			3	3		
18	F	5	Total	O	0	0
			5	5		
18	G	3	Total	O	0	0
			3	3		
18	H	16	Total	O	0	0
			16	16		
18	I	7	Total	O	0	0
			7	7		
18	J	10	Total	O	0	0
			10	10		
18	K	13	Total	O	0	0
			13	13		
18	L	18	Total	O	0	0
			18	18		
18	M	14	Total	O	0	0
			14	14		
18	N	9	Total	O	0	0
			9	9		
18	O	1	Total	O	0	0
			1	1		

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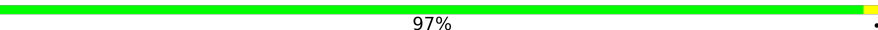
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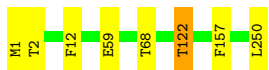
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
18	P	7	Total 7	O 7	0	0
18	Q	6	Total 6	O 6	0	0
18	R	5	Total 5	O 5	0	0
18	S	3	Total 3	O 3	0	0
18	T	6	Total 6	O 6	0	0
18	U	10	Total 10	O 10	0	0
18	V	10	Total 10	O 10	0	0
18	W	4	Total 4	O 4	0	0
18	X	8	Total 8	O 8	0	0
18	Y	14	Total 14	O 14	0	0
18	Z	9	Total 9	O 9	0	0
18	a	17	Total 17	O 17	0	0
18	b	8	Total 8	O 8	0	0

3 Residue-property plots [i](#)

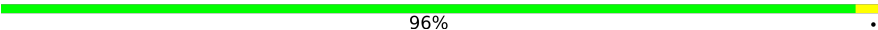
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density.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

- Molecule 1: Proteasome subunit alpha type-2

Chain A:  97% .



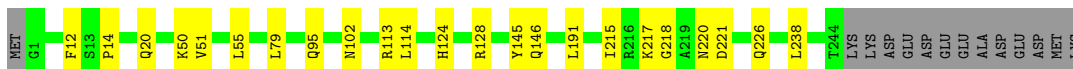
- Molecule 1: Proteasome subunit alpha type-2

Chain O:  96% .



- Molecule 2: Proteasome subunit alpha type-3

Chain B:  86% 9% 5%



- Molecule 2: Proteasome subunit alpha type-3

Chain P:  87% 7% 5%



- Molecule 3: Proteasome subunit alpha type-4

Chain C:  87% 6% 6%

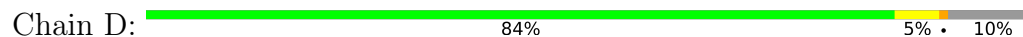


- Molecule 3: Proteasome subunit alpha type-4

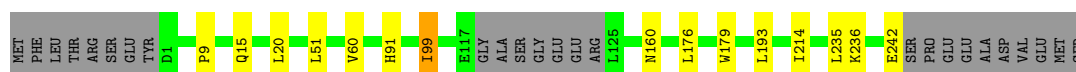
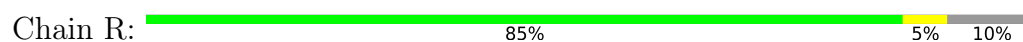
Chain Q:  87% 6% 6%



• Molecule 4: Proteasome subunit alpha type-5



• Molecule 4: Proteasome subunit alpha type-5



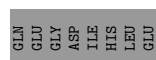
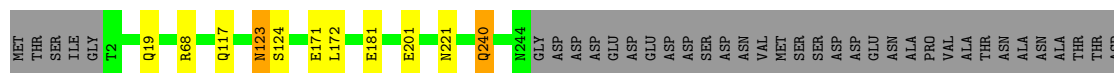
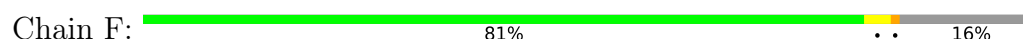
• Molecule 5: Proteasome subunit alpha type-6



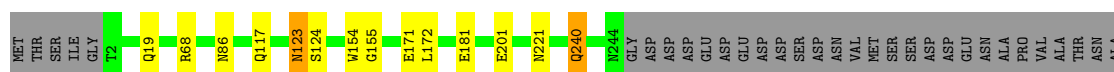
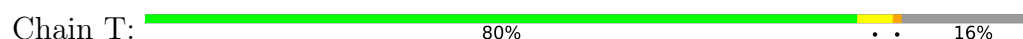
• Molecule 5: Proteasome subunit alpha type-6



• Molecule 6: Probable proteasome subunit alpha type-7



• Molecule 6: Probable proteasome subunit alpha type-7



ASN
ALA
THR
THR
ASP
GLN
GLU
GLY
ASP
ILE
HIS
LEU
GLU

• Molecule 7: Proteasome subunit alpha type-1

Chain G:  90% 6% .

MET SER GLY ALA ALA ALA ALA SER ALA ALA G2 F23 T26 V73 I78 P79 N83 M14 L115 R122 M125 T133 Q167 T171 R235 L236 Q242 ASP

• Molecule 7: Proteasome subunit alpha type-1

Chain U:  87% 8% . .

MET SER GLY ALA ALA ALA ALA SER ALA ALA G2 P12 E13 F23 T26 T59 V60 V73 I78 P79 N83 D106 L115 R122 M125 T133 Y146 Q167 T171 V216 R235 L236 Q242 ASP

• Molecule 8: Proteasome subunit beta type-2

Chain H:  86% 9% . .

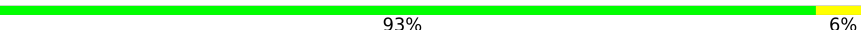
T1 V4 K7 I14 N30 L34 S38 P39 K40 V55 L68 L98 A101 D104 P105 S112 I113 H114 S118 Y124 L125 S126 L127 E139 Q144 M165 V195 R196 I223 E226 GLN VAL ASP ILE THR ALA

• Molecule 8: Proteasome subunit beta type-2

Chain V:  86% 9% . .

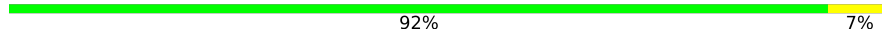
T1 T2 I3 V4 K7 I14 N30 L34 S38 P39 K40 E53 A54 V55 L68 L80 L98 I99 V100 A101 S112 I113 T118 L119 L125 S126 L127 E139 M165 S169 V195 R196 I223 E226 GLN VAL ASP ILE THR ALA

• Molecule 9: Proteasome subunit beta type-3

Chain I:  93% 6%

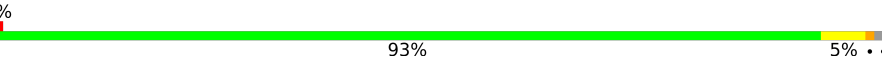
MET S1 G9 I10 S36 N37 K38 K41 N71 F123 C128 A141 E150 L171 D177 G183 D204

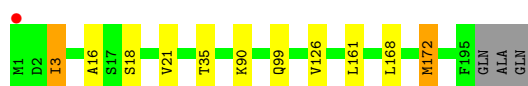
• Molecule 9: Proteasome subunit beta type-3

Chain W:  92% 7%

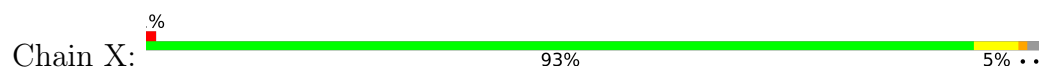
MET S1 G9 I10 S36 N37 K38 K41 N71 R97 F123 C128 A141 E150 L171 R176 D177 G183 D204

• Molecule 10: Proteasome subunit beta type-4

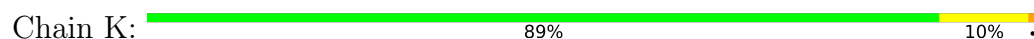
Chain J:  93% 5% . .



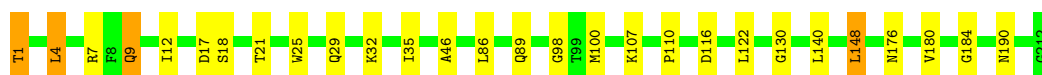
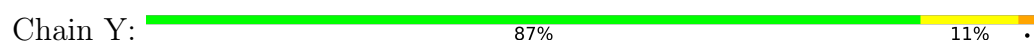
- Molecule 10: Proteasome subunit beta type-4



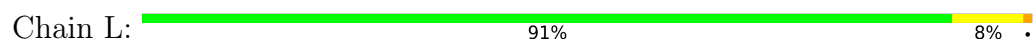
- Molecule 11: Proteasome subunit beta type-5



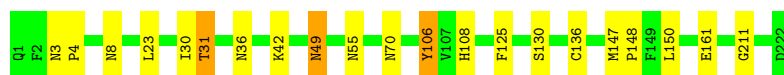
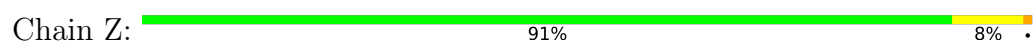
- Molecule 11: Proteasome subunit beta type-5



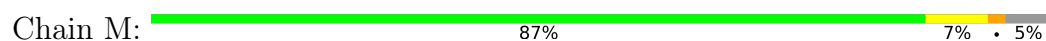
- Molecule 12: Proteasome subunit beta type-6



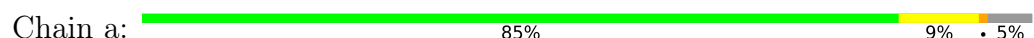
- Molecule 12: Proteasome subunit beta type-6



- Molecule 13: Proteasome subunit beta type-7

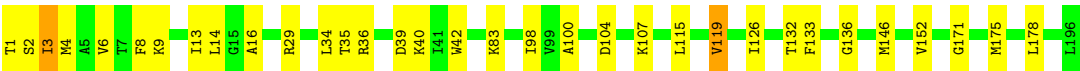
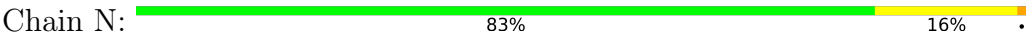


- Molecule 13: Proteasome subunit beta type-7

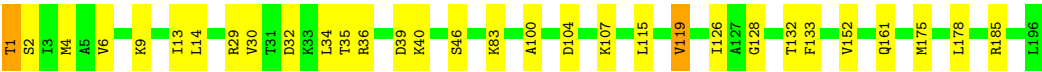
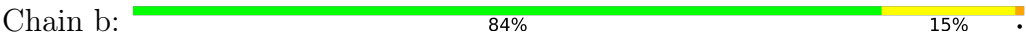




● Molecule 14: Proteasome subunit beta type-1



● Molecule 14: Proteasome subunit beta type-1



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	136.96Å 302.05Å 146.01Å 90.00° 113.09° 90.00°	Depositor
Resolution (Å)	15.00 – 2.80 15.00 – 2.80	Depositor EDS
% Data completeness (in resolution range)	97.2 (15.00-2.80) 97.2 (15.00-2.80)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.16 (at 2.81Å)	Xtriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.182 , 0.208 0.166 , 0.209	Depositor DCC
R_{free} test set	12970 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	69.5	Xtriage
Anisotropy	0.526	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 68.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	49760	wwPDB-VP
Average B, all atoms (Å ²)	90.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.35% 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: CL, MG, VSZ

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	1.05	1/1952 (0.1%)	1.37	0/2642
1	O	1.05	0/1952	1.39	0/2642
2	B	1.06	0/1934	1.41	0/2618
2	P	1.06	0/1934	1.40	0/2618
3	C	1.05	0/1910	1.42	0/2586
3	Q	1.05	0/1910	1.43	0/2586
4	D	1.05	0/1837	1.42	2/2475 (0.1%)
4	R	1.05	0/1837	1.43	0/2475
5	E	1.04	0/1800	1.40	0/2433
5	S	1.05	0/1800	1.41	0/2433
6	F	1.04	0/1932	1.42	0/2609
6	T	1.04	0/1932	1.41	0/2609
7	G	1.03	0/1945	1.38	0/2634
7	U	1.04	0/1945	1.39	2/2634 (0.1%)
8	H	1.04	0/1750	1.37	0/2373
8	V	1.04	0/1750	1.37	0/2373
9	I	1.02	0/1611	1.36	1/2174 (0.0%)
9	W	1.04	0/1611	1.37	1/2174 (0.0%)
10	J	1.02	0/1589	1.35	0/2142
10	X	1.02	0/1589	1.33	0/2142
11	K	1.00	0/1681	1.37	0/2274
11	Y	1.00	0/1681	1.37	1/2274 (0.0%)
12	L	1.02	0/1795	1.35	0/2420
12	Z	1.02	0/1795	1.35	0/2420
13	M	1.02	0/1855	1.35	0/2514
13	a	1.02	0/1855	1.35	3/2514 (0.1%)
14	N	1.01	0/1541	1.37	0/2087
14	b	1.02	0/1541	1.38	0/2087
All	All	1.03	1/50264 (0.0%)	1.38	10/67962 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	68	THR	N-CA	5.03	1.49	1.46

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
13	a	233	ILE	CA-CB-CG1	6.64	121.70	110.40
11	Y	184	GLY	CA-C-O	-5.59	118.29	122.37
9	W	183	GLY	CA-C-O	-5.33	118.61	122.45
9	I	183	GLY	CA-C-O	-5.33	118.62	122.45
13	a	188	ASP	CA-CB-CG	5.26	117.86	112.60

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	2	0
1	O	1915	0	1929	7	0
2	B	1904	0	1904	11	0
2	P	1904	0	1904	10	0
3	C	1881	0	1895	10	0
3	Q	1881	0	1895	11	0
4	D	1813	0	1797	8	0
4	R	1813	0	1797	5	0
5	E	1773	0	1775	8	0
5	S	1773	0	1775	11	0
6	F	1892	0	1883	4	0
6	T	1892	0	1883	7	0
7	G	1907	0	1901	6	0
7	U	1907	0	1901	10	0
8	H	1719	0	1718	13	0
8	V	1719	0	1718	11	0
9	I	1581	0	1574	10	0
9	W	1581	0	1574	11	0
10	J	1561	0	1569	5	0
10	X	1561	0	1569	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
11	K	1644	0	1594	12	0
11	Y	1644	0	1594	15	0
12	L	1757	0	1711	11	0
12	Z	1757	0	1711	13	0
13	M	1824	0	1832	15	0
13	a	1824	0	1832	15	0
14	N	1512	0	1480	21	0
14	b	1512	0	1480	21	0
15	G	1	0	0	0	0
15	I	1	0	0	0	0
15	K	1	0	0	0	0
15	N	1	0	0	0	0
15	W	1	0	0	0	0
15	Y	1	0	0	0	0
15	Z	1	0	0	0	0
16	G	1	0	0	0	0
16	U	1	0	0	0	0
17	H	26	0	0	1	0
17	K	26	0	0	3	0
17	N	26	0	0	1	0
17	V	26	0	0	1	0
17	Y	26	0	0	3	0
17	b	26	0	0	4	0
18	A	3	0	0	0	0
18	B	10	0	0	0	0
18	C	7	0	0	0	0
18	D	3	0	0	0	0
18	E	3	0	0	0	0
18	F	5	0	0	0	0
18	G	3	0	0	0	0
18	H	16	0	0	1	0
18	I	7	0	0	0	0
18	J	10	0	0	0	0
18	K	13	0	0	0	0
18	L	18	0	0	0	0
18	M	14	0	0	1	0
18	N	9	0	0	0	0
18	O	1	0	0	0	0
18	P	7	0	0	0	0
18	Q	6	0	0	1	0
18	R	5	0	0	0	0
18	S	3	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
18	T	6	0	0	0	0
18	U	10	0	0	0	0
18	V	10	0	0	0	0
18	W	4	0	0	1	0
18	X	8	0	0	0	0
18	Y	14	0	0	1	0
18	Z	9	0	0	0	0
18	a	17	0	0	2	0
18	b	8	0	0	0	0
All	All	49760	0	49124	236	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 2.

The worst 5 of 236 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:160:GLN:HE21	3:C:160:GLN:HA	1.35	0.91
3:Q:160:GLN:HA	3:Q:160:GLN:HE21	1.38	0.86
1:O:12:PHE:H	2:P:20:GLN:HE22	1.29	0.80
7:G:23:PHE:O	7:G:26:THR:HB	1.83	0.78
7:U:23:PHE:O	7:U:26:THR:HB	1.86	0.76

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	248/250 (99%)	240 (97%)	7 (3%)	1 (0%)	30	60
1	O	248/250 (99%)	238 (96%)	9 (4%)	1 (0%)	30	60

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	242/258 (94%)	233 (96%)	5 (2%)	4 (2%)	7	25
2	P	242/258 (94%)	233 (96%)	5 (2%)	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%)	226 (98%)	5 (2%)	0	100	100
4	R	231/260 (89%)	227 (98%)	4 (2%)	0	100	100
5	E	229/234 (98%)	222 (97%)	7 (3%)	0	100	100
5	S	229/234 (98%)	222 (97%)	7 (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%)	194 (96%)	8 (4%)	0	100	100
9	W	202/205 (98%)	194 (96%)	8 (4%)	0	100	100
10	J	193/198 (98%)	187 (97%)	6 (3%)	0	100	100
10	X	193/198 (98%)	187 (97%)	6 (3%)	0	100	100
11	K	210/212 (99%)	206 (98%)	4 (2%)	0	100	100
11	Y	210/212 (99%)	206 (98%)	4 (2%)	0	100	100
12	L	220/222 (99%)	216 (98%)	4 (2%)	0	100	100
12	Z	220/222 (99%)	215 (98%)	5 (2%)	0	100	100
13	M	231/246 (94%)	223 (96%)	8 (4%)	0	100	100
13	a	231/246 (94%)	223 (96%)	8 (4%)	0	100	100
14	N	194/196 (99%)	190 (98%)	4 (2%)	0	100	100
14	b	194/196 (99%)	191 (98%)	3 (2%)	0	100	100
All	All	6284/6614 (95%)	6129 (98%)	141 (2%)	14 (0%)	43	72

5 of 14 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	2	THR
2	B	51	VAL

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Mol	Chain	Res	Type
2	B	221	ASP
3	C	202	GLN
1	O	2	THR

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%)	204 (98%)	5 (2%)	43	77
1	O	209/209 (100%)	204 (98%)	5 (2%)	43	77
2	B	203/216 (94%)	196 (97%)	7 (3%)	32	68
2	P	203/216 (94%)	196 (97%)	7 (3%)	32	68
3	C	212/226 (94%)	203 (96%)	9 (4%)	26	61
3	Q	212/226 (94%)	203 (96%)	9 (4%)	26	61
4	D	194/215 (90%)	184 (95%)	10 (5%)	21	53
4	R	194/215 (90%)	184 (95%)	10 (5%)	21	53
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%)	192 (96%)	9 (4%)	24	58
6	T	201/239 (84%)	192 (96%)	9 (4%)	24	58
7	G	206/210 (98%)	199 (97%)	7 (3%)	32	68
7	U	206/210 (98%)	198 (96%)	8 (4%)	28	64
8	H	185/190 (97%)	169 (91%)	16 (9%)	10	31
8	V	185/190 (97%)	167 (90%)	18 (10%)	8	25
9	I	172/173 (99%)	170 (99%)	2 (1%)	63	87
9	W	172/173 (99%)	170 (99%)	2 (1%)	63	87
10	J	173/175 (99%)	168 (97%)	5 (3%)	37	73
10	X	173/175 (99%)	168 (97%)	5 (3%)	37	73
11	K	169/169 (100%)	157 (93%)	12 (7%)	13	39

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
11	Y	169/169 (100%)	157 (93%)	12 (7%)	13	39
12	L	185/185 (100%)	177 (96%)	8 (4%)	26	60
12	Z	185/185 (100%)	177 (96%)	8 (4%)	26	60
13	M	199/208 (96%)	189 (95%)	10 (5%)	22	54
13	a	199/208 (96%)	190 (96%)	9 (4%)	24	58
14	N	162/162 (100%)	150 (93%)	12 (7%)	13	37
14	b	162/162 (100%)	152 (94%)	10 (6%)	16	45
All	All	5320/5540 (96%)	5084 (96%)	236 (4%)	25	59

5 of 236 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
14	N	115	LEU
13	a	104	ARG
4	R	176	LEU
13	a	48	ASN
11	Y	9	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 169 such sidechains are listed below:

Mol	Chain	Res	Type
6	T	117	GLN
11	Y	143	ASN
6	T	240	GLN
8	V	189	ASN
12	Z	36	ASN

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 [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 15 ligands modelled in this entry, 9 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	VSZ	Y	302	11	25,25,25	1.09	2 (8%)	31,34,34	1.29	3 (9%)
17	VSZ	H	301	8	25,25,25	1.31	5 (20%)	31,34,34	1.15	2 (6%)
17	VSZ	b	201	14	25,25,25	1.02	3 (12%)	31,34,34	1.06	2 (6%)
17	VSZ	N	202	14	25,25,25	0.91	1 (4%)	31,34,34	0.96	1 (3%)
17	VSZ	V	301	8	25,25,25	1.24	2 (8%)	31,34,34	1.12	2 (6%)
17	VSZ	K	302	11	25,25,25	1.30	2 (8%)	31,34,34	1.32	4 (12%)

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	VSZ	Y	302	11	-	16/40/40/40	-
17	VSZ	H	301	8	-	5/40/40/40	-
17	VSZ	b	201	14	-	10/40/40/40	-
17	VSZ	N	202	14	-	9/40/40/40	-
17	VSZ	V	301	8	-	7/40/40/40	-
17	VSZ	K	302	11	-	12/40/40/40	-

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
17	K	302	VSZ	C4-C9	-3.68	1.51	1.54

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
17	H	301	VSZ	C4-C9	-3.37	1.51	1.54
17	V	301	VSZ	C4-C9	-3.30	1.51	1.54
17	K	302	VSZ	C4-C5	-3.25	1.50	1.55
17	Y	302	VSZ	C4-C9	-2.82	1.51	1.54

The worst 5 of 14 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
17	Y	302	VSZ	O10-C9-C11	-3.62	103.05	110.63
17	K	302	VSZ	C15-C14-C18	-2.91	104.28	111.38
17	K	302	VSZ	O10-C9-C11	-2.85	104.68	110.63
17	b	201	VSZ	O3-C1-C4	-2.84	118.49	125.27
17	K	302	VSZ	C9-C4-C1	-2.82	104.80	110.65

There are no chirality outliers.

5 of 59 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
17	K	302	VSZ	O12-C11-C9-O10
17	K	302	VSZ	C9-C4-C5-C6
17	N	202	VSZ	O12-C11-C9-O10
17	N	202	VSZ	N13-C11-C9-O10
17	N	202	VSZ	N20-C21-C22-C24

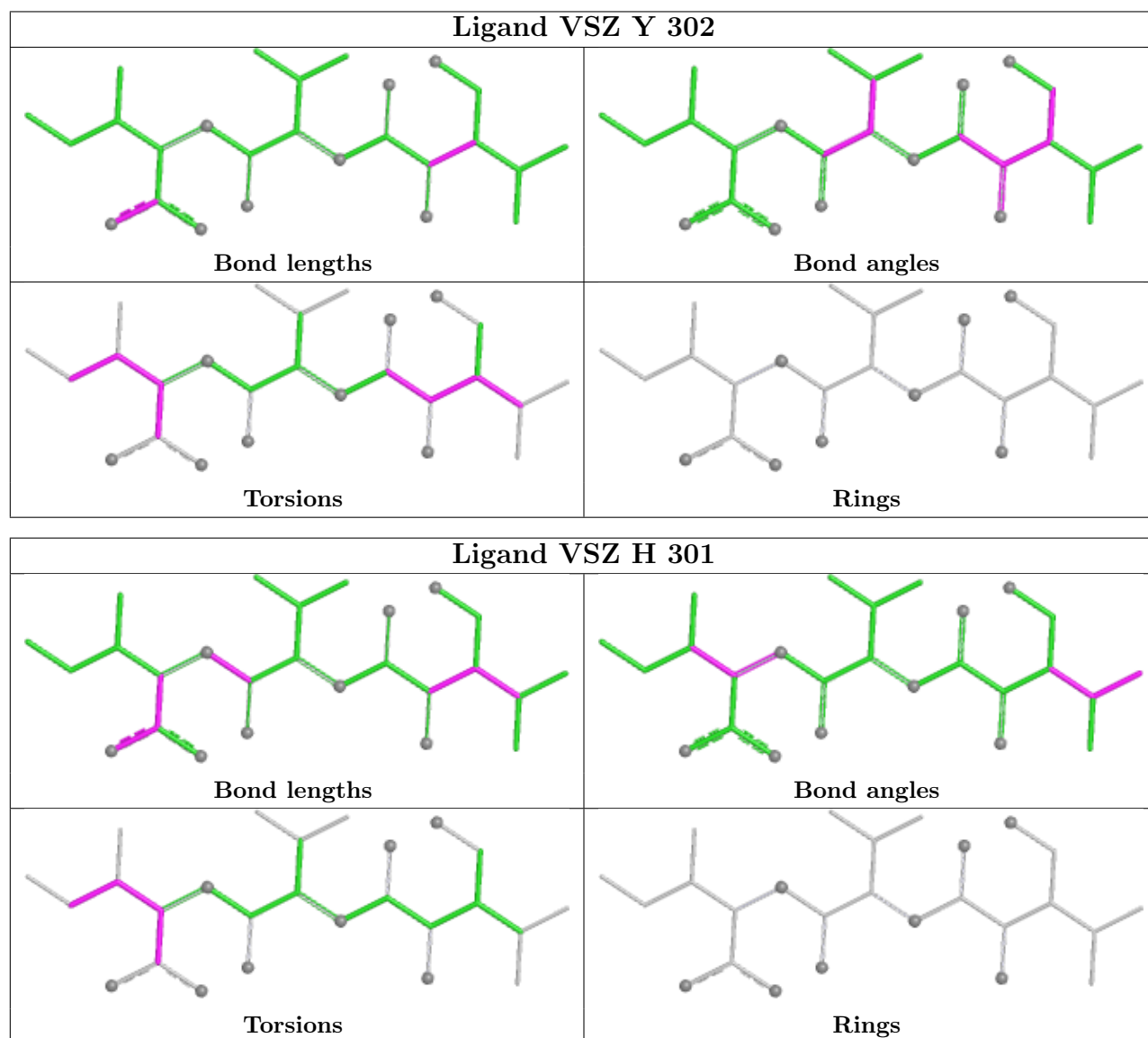
There are no ring outliers.

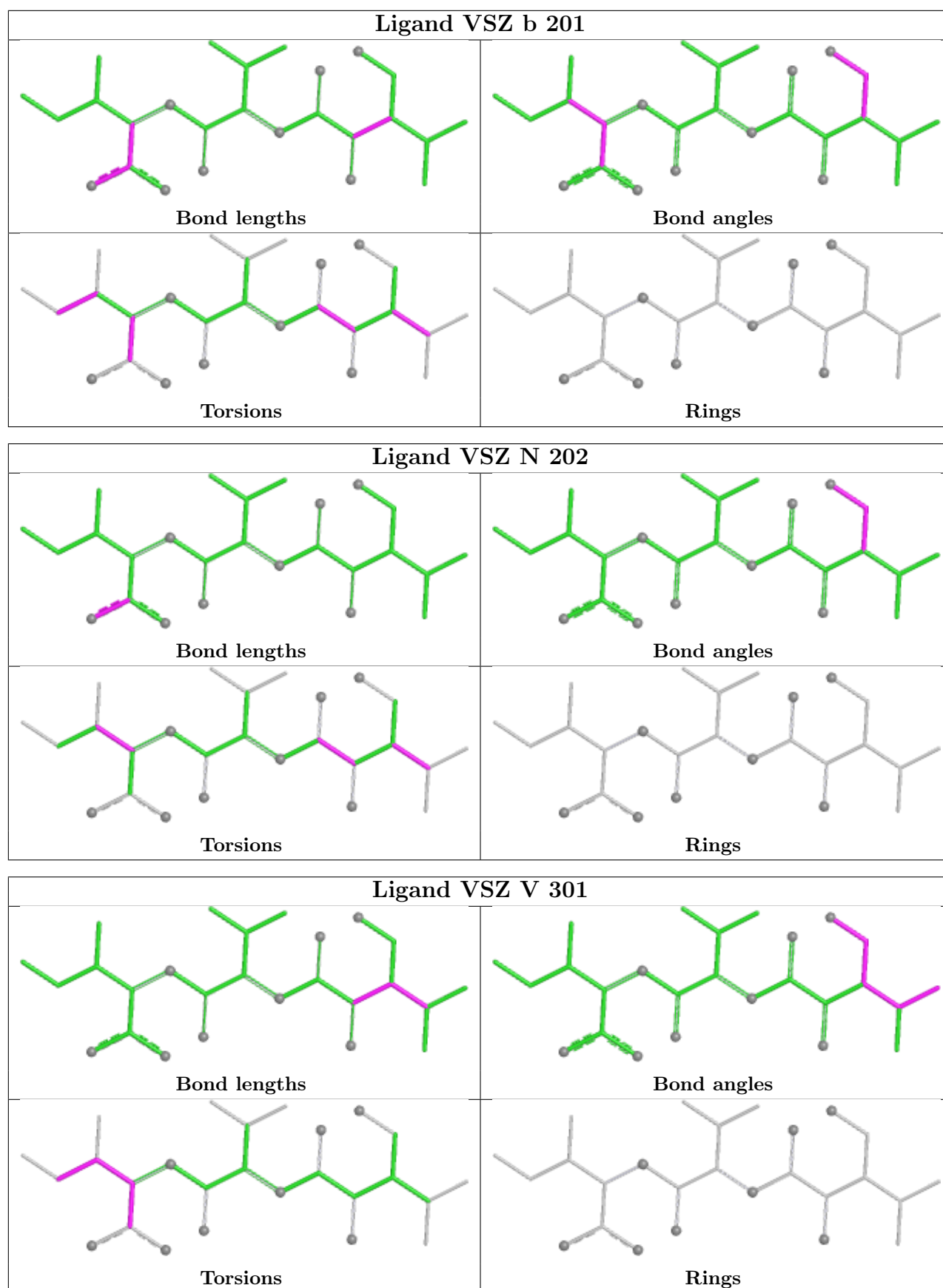
6 monomers are involved in 13 short contacts:

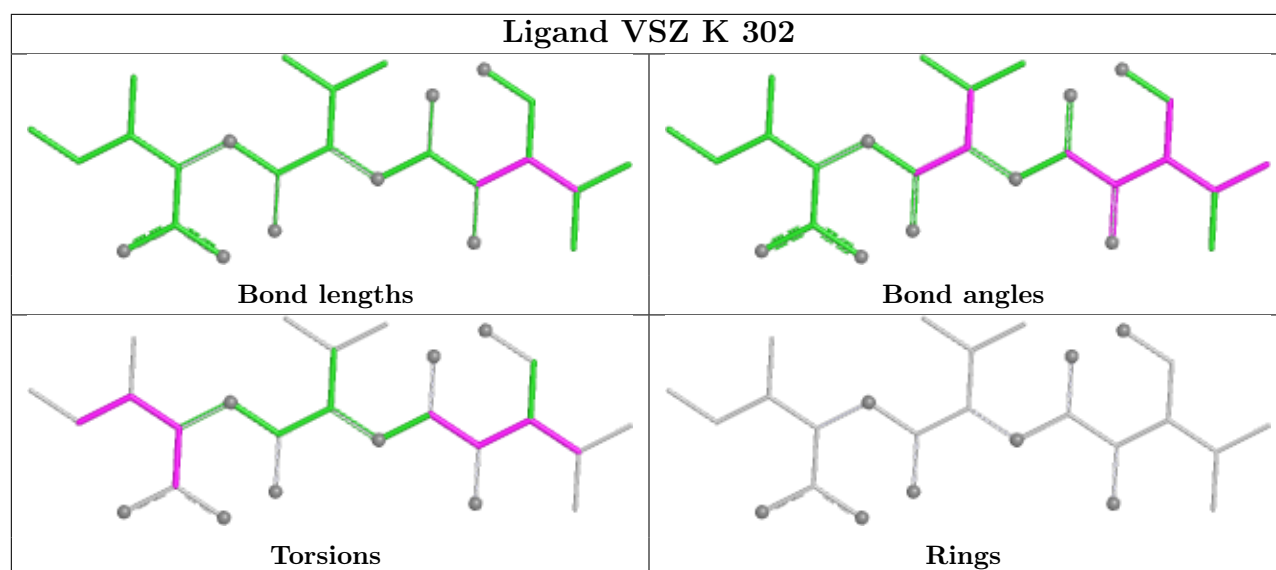
Mol	Chain	Res	Type	Clashes	Symm-Clashes
17	Y	302	VSZ	3	0
17	H	301	VSZ	1	0
17	b	201	VSZ	4	0
17	N	202	VSZ	1	0
17	V	301	VSZ	1	0
17	K	302	VSZ	3	0

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 ⓘ

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%)	-0.83	0 100 100	66, 82, 119, 164	0
1	O	250/250 (100%)	-0.77	0 100 100	72, 93, 134, 169	0
2	B	244/258 (94%)	-0.66	0 100 100	66, 94, 149, 208	0
2	P	244/258 (94%)	-0.68	0 100 100	69, 93, 143, 201	0
3	C	240/254 (94%)	-0.62	0 100 100	66, 98, 156, 175	0
3	Q	240/254 (94%)	-0.63	2 (0%) 82 75	76, 110, 177, 197	0
4	D	235/260 (90%)	-0.79	0 100 100	68, 95, 125, 155	0
4	R	235/260 (90%)	-0.66	0 100 100	73, 106, 138, 162	0
5	E	231/234 (98%)	-0.75	0 100 100	72, 97, 130, 160	0
5	S	231/234 (98%)	-0.70	0 100 100	72, 107, 147, 165	0
6	F	243/288 (84%)	-0.81	0 100 100	67, 92, 139, 157	0
6	T	243/288 (84%)	-0.69	0 100 100	70, 102, 149, 178	0
7	G	241/252 (95%)	-0.84	0 100 100	63, 82, 115, 152	0
7	U	241/252 (95%)	-0.76	0 100 100	66, 89, 122, 155	0
8	H	226/232 (97%)	-0.83	1 (0%) 88 84	57, 74, 108, 172	0
8	V	226/232 (97%)	-0.83	1 (0%) 88 84	61, 78, 111, 202	0
9	I	204/205 (99%)	-0.96	0 100 100	54, 71, 96, 122	0
9	W	204/205 (99%)	-0.98	0 100 100	56, 72, 102, 128	0
10	J	195/198 (98%)	-0.90	1 (0%) 87 82	57, 75, 102, 144	0
10	X	195/198 (98%)	-0.90	1 (0%) 87 82	60, 76, 100, 164	0
11	K	212/212 (100%)	-0.94	0 100 100	54, 72, 95, 111	0
11	Y	212/212 (100%)	-0.91	0 100 100	59, 74, 99, 120	0
12	L	222/222 (100%)	-0.90	0 100 100	57, 75, 107, 135	0
12	Z	222/222 (100%)	-0.88	0 100 100	57, 77, 109, 130	0

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
13	M	233/246 (94%)	-0.88	0 100 100	57, 78, 105, 128	0
13	a	233/246 (94%)	-0.94	1 (0%) 88 84	56, 76, 100, 116	0
14	N	196/196 (100%)	-0.92	0 100 100	58, 72, 103, 129	0
14	b	196/196 (100%)	-0.92	0 100 100	61, 74, 104, 132	0
All	All	6344/6614 (95%)	-0.81	7 (0%) 92 90	54, 84, 135, 208	0

The worst 5 of 7 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	Q	50	LEU	3.6
10	J	1	MET	3.0
8	V	223	ILE	3.0
10	X	1	MET	2.9
8	H	223	ILE	2.8

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
17	VSZ	N	202	26/26	0.91	0.11	59,80,95,107	0
17	VSZ	Y	302	26/26	0.91	0.09	65,93,105,125	0
17	VSZ	b	201	26/26	0.91	0.12	66,84,98,110	0
17	VSZ	K	302	26/26	0.94	0.09	56,93,114,129	0
17	VSZ	V	301	26/26	0.94	0.09	64,74,95,106	0
17	VSZ	H	301	26/26	0.95	0.09	67,75,95,102	0
15	MG	G	301	1/1	0.97	0.10	74,74,74,74	0

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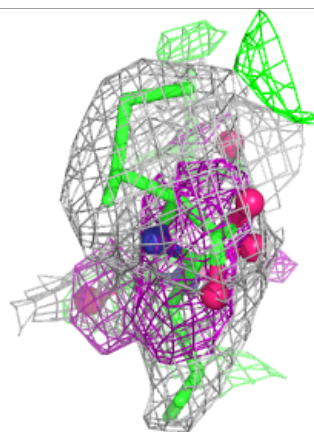
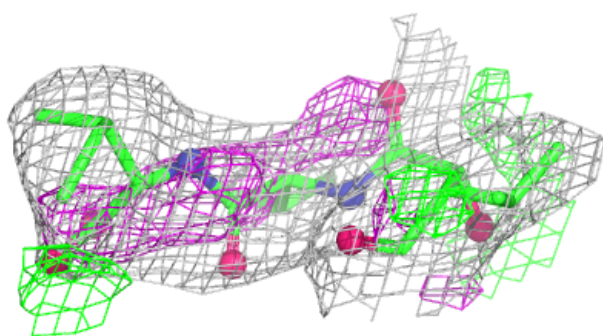
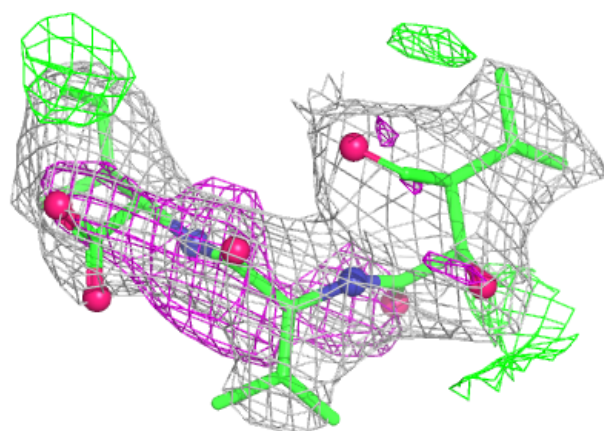
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
15	MG	Z	301	1/1	0.97	0.07	80,80,80,80	0
16	CL	G	302	1/1	0.98	0.11	69,69,69,69	0
16	CL	U	301	1/1	0.98	0.10	79,79,79,79	0
15	MG	W	301	1/1	0.98	0.06	81,81,81,81	0
15	MG	N	201	1/1	0.98	0.04	65,65,65,65	0
15	MG	Y	301	1/1	0.99	0.03	86,86,86,86	0
15	MG	I	301	1/1	0.99	0.05	77,77,77,77	0
15	MG	K	301	1/1	1.00	0.07	80,80,80,80	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.

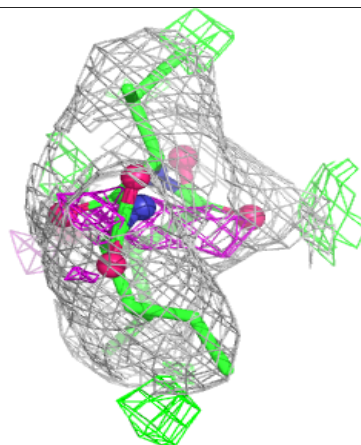
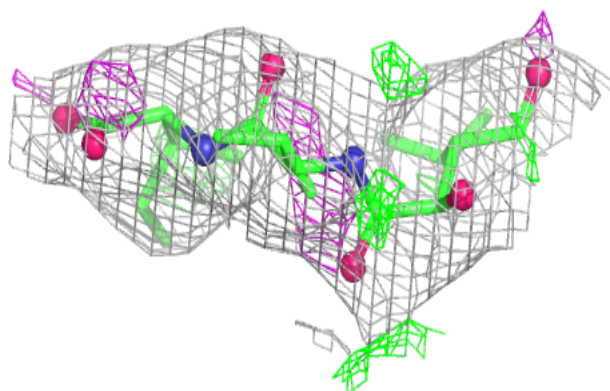
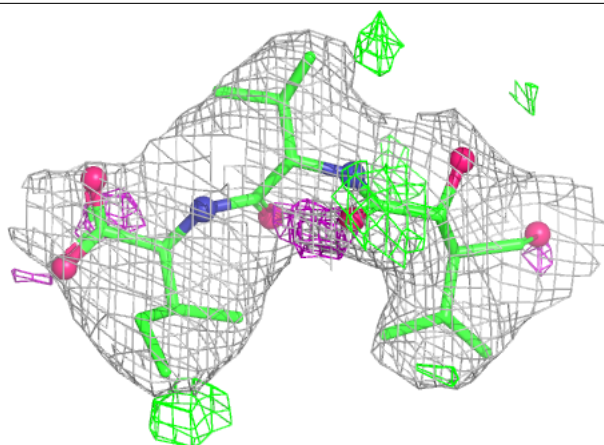
Electron density around VSZ N 202:

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



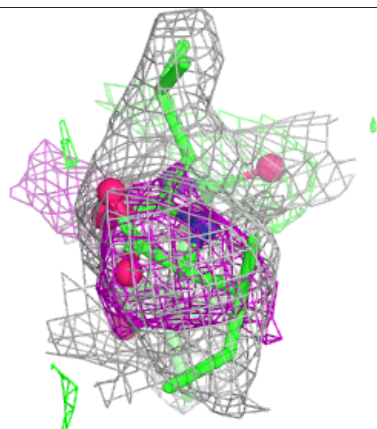
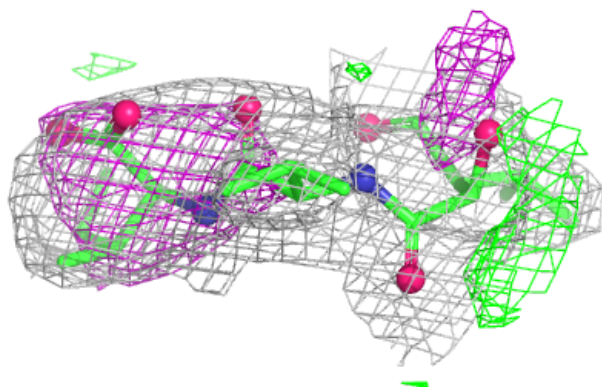
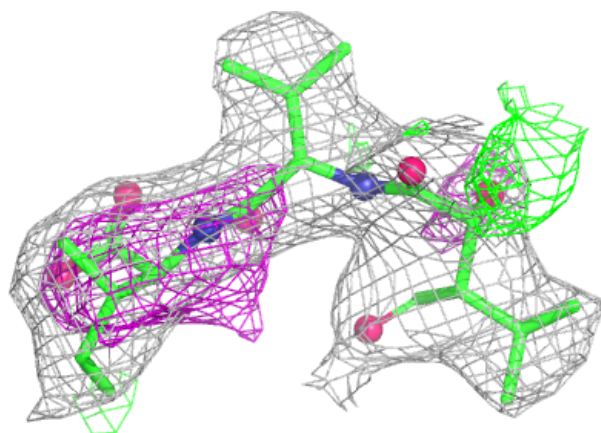
Electron density around VSZ Y 302:

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

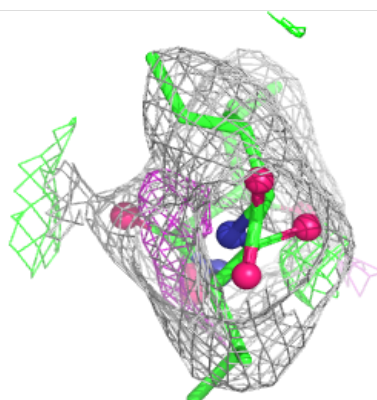
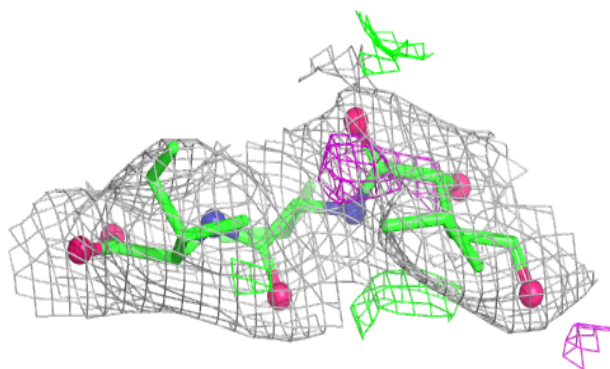
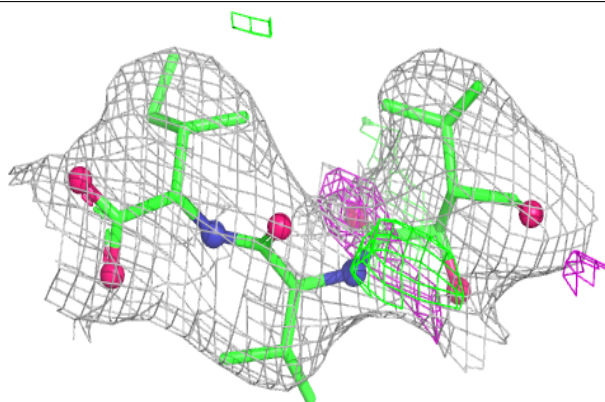


Electron density around VSZ b 201:

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

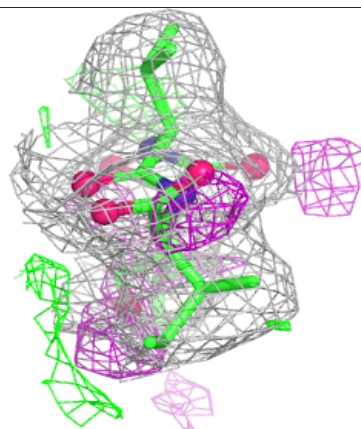
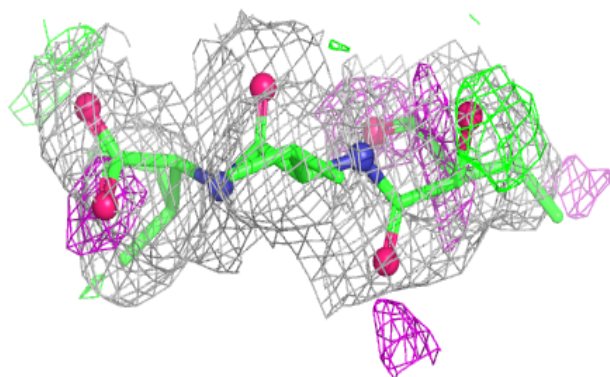
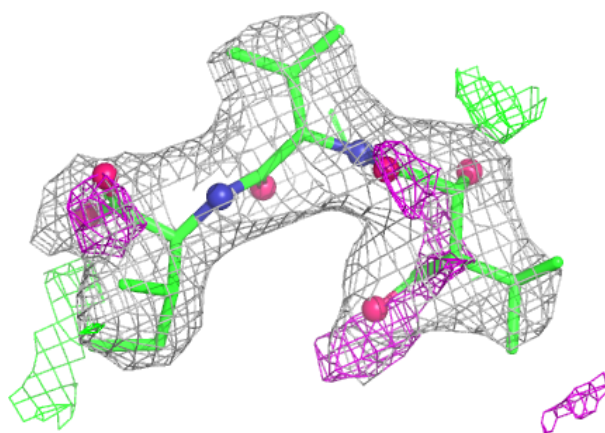
**Electron density around VSZ K 302:**

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

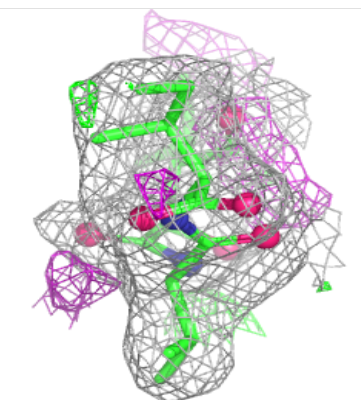
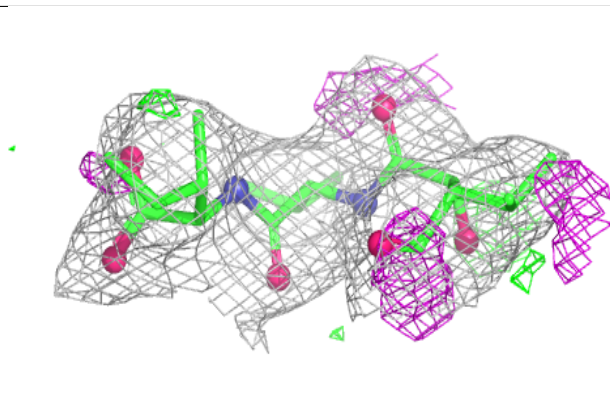
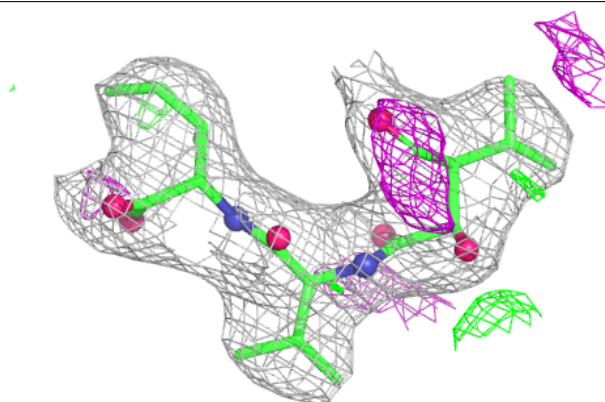


Electron density around VSZ V 301:

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

**Electron density around VSZ 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)



6.5 Other polymers [i](#)

There are no such residues in this entry.