



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 6, 2026 – 01:55 PM UTC

PDB ID : 4LTC / pdb_00004ltc
Title : Crystal structure of yeast 20S proteasome in complex with enone carmaphyicin analogue 6
Authors : Stein, M.; Trivella, D.B.B.; Groll, M.
Deposited on : 2013-07-23
Resolution : 2.50 Å (reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtrriage (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

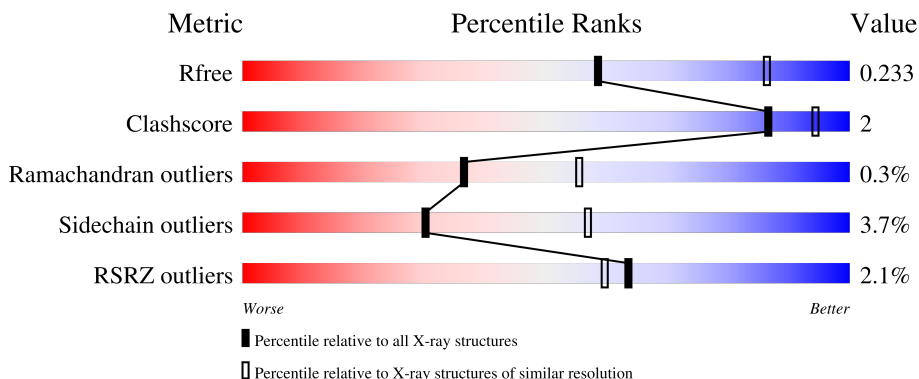
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (2.50-2.50)

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	<div style="display: flex; align-items: center;"> <div style="width: 4%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 94%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 5%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 1%; height: 10px; background-color: orange; margin-right: 2px;"></div> <div style="width: 1%; height: 10px; background-color: grey;"></div> </div>
1	O	250	<div style="display: flex; align-items: center;"> <div style="width: 2%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 97%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 1%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 1%; height: 10px; background-color: orange; margin-right: 2px;"></div> <div style="width: 1%; height: 10px; background-color: grey;"></div> </div>
2	B	258	<div style="display: flex; align-items: center;"> <div style="width: 4%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 83%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 10%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 5%; height: 10px; background-color: orange; margin-right: 2px;"></div> <div style="width: 1%; height: 10px; background-color: grey;"></div> </div>
2	P	258	<div style="display: flex; align-items: center;"> <div style="width: 3%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 85%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 8%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 5%; height: 10px; background-color: orange; margin-right: 2px;"></div> <div style="width: 1%; height: 10px; background-color: grey;"></div> </div>
3	C	254	<div style="display: flex; align-items: center;"> <div style="width: 4%; height: 10px; background-color: red; margin-right: 2px;"></div> <div style="width: 86%; height: 10px; background-color: green; margin-right: 2px;"></div> <div style="width: 8%; height: 10px; background-color: yellow; margin-right: 2px;"></div> <div style="width: 5%; height: 10px; background-color: orange; margin-right: 2px;"></div> <div style="width: 1%; height: 10px; background-color: grey;"></div> </div>

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Mol	Chain	Length	Quality of chain
3	Q	254	6% 87% 7% • 5%
4	D	260	4% 86% 7% • 7%
4	R	260	3% 86% 7% • 7%
5	E	234	3% 88% 11%
5	S	234	5% 89% 11%
6	F	287	% 78% 5% • 15%
6	T	287	2% 80% 5% • 15%
7	G	252	2% 88% 8% • •
7	U	252	2% 87% 8% • •
8	H	232	92% • •
8	V	232	90% 6% •
9	I	205	% 95% •
9	W	205	96% •
10	J	198	3% 95% 5%
10	X	198	3% 95% • •
11	K	212	% 89% 9% •
11	Y	212	91% 8% •
12	L	222	% 91% 7% •
12	Z	222	% 91% 8% •
13	M	233	92% 7% •
13	a	233	% 91% 8% •
14	N	196	96% • •
14	b	196	94% 5% •

2 Entry composition [i](#)

There are 16 unique types of molecules in this entry. The entry contains 52219 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Proteasome subunit alpha type-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	250	Total 1915	C 1219	N 315	O 377	S 4	0	0	0
1	O	250	Total 1915	C 1219	N 315	O 377	S 4	0	0	0

- Molecule 2 is a protein called Proteasome subunit alpha type-3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	244	Total 1904	C 1201	N 321	O 379	S 3	0	0	0
2	P	244	Total 1904	C 1201	N 321	O 379	S 3	0	0	0

- Molecule 3 is a protein called Proteasome subunit alpha type-4.

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

- Molecule 4 is a protein called Proteasome subunit alpha type-5.

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

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

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

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

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

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

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

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

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

- Molecule 9 is a protein called Proteasome 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	198	Total	C	N	O	S	0	0	0
			1585	1005	269	305	6			

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

- Molecule 11 is a protein called Proteasome subunit beta type-5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
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
			Total	C	N	O	S			
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			

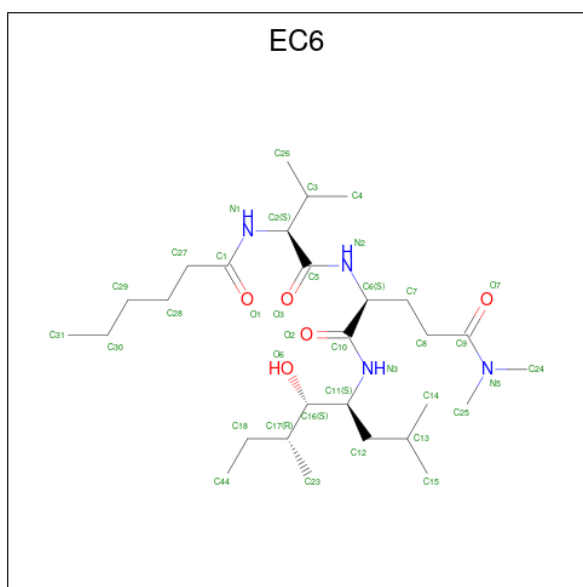
- Molecule 13 is a protein called Proteasome subunit beta type-7.

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

- Molecule 15 is N-hexanoyl-L-valyl-N 1 -[(4S,5S,6R)-5-hydroxy-2,6-dimethyloctan-4-yl]-N 5 , N 5 -dimethyl-L-glutamamide (CCD ID: EC6) (formula: C₂₈H₅₄N₄O₅).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
15	K	1	Total	C	N	O	0	0
			37	28	4	5		
15	Y	1	Total	C	N	O	0	0
			37	28	4	5		

- Molecule 16 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
16	A	99	Total	O	0	0
			99	99		
16	B	77	Total	O	0	0
			77	77		
16	C	85	Total	O	0	0
			85	85		
16	D	86	Total	O	0	0
			86	86		
16	E	57	Total	O	0	0
			57	57		
16	F	92	Total	O	0	0
			92	92		
16	G	121	Total	O	0	0
			121	121		
16	O	66	Total	O	0	0
			66	66		
16	P	75	Total	O	0	0
			75	75		
16	Q	73	Total	O	0	0
			73	73		

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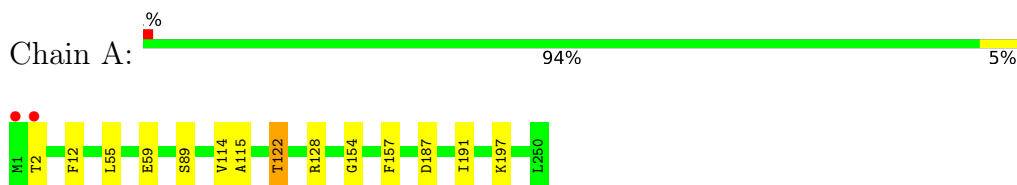
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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
16	R	85	Total O 85 85	0	0
16	S	49	Total O 49 49	0	0
16	T	89	Total O 89 89	0	0
16	U	110	Total O 110 110	0	0
16	H	101	Total O 101 101	0	0
16	I	107	Total O 107 107	0	0
16	J	103	Total O 103 103	0	0
16	K	104	Total O 104 104	0	0
16	L	110	Total O 110 110	0	0
16	M	132	Total O 132 132	0	0
16	N	101	Total O 101 101	0	0
16	V	91	Total O 91 91	0	0
16	W	104	Total O 104 104	0	0
16	X	98	Total O 98 98	0	0
16	Y	73	Total O 73 73	0	0
16	Z	102	Total O 102 102	0	0
16	a	111	Total O 111 111	0	0
16	b	106	Total O 106 106	0	0

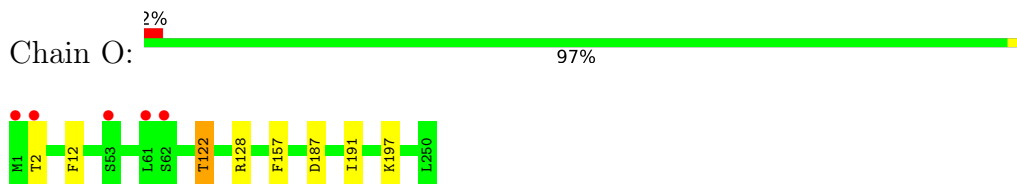
3 Residue-property plots [i](#)

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

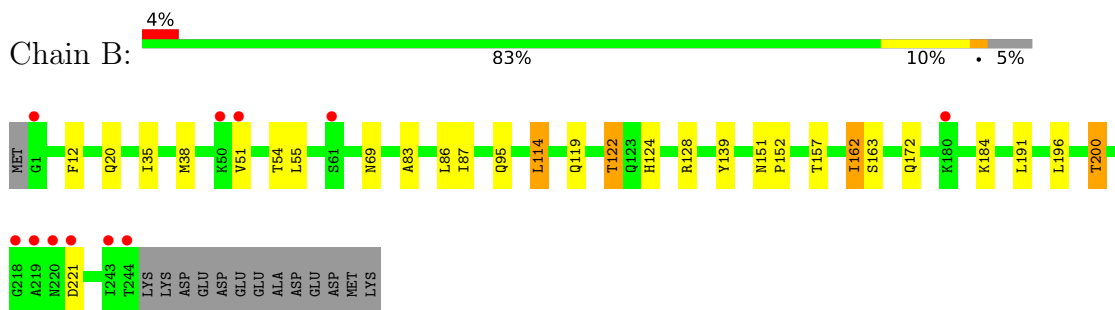
- Molecule 1: Proteasome subunit alpha type-2



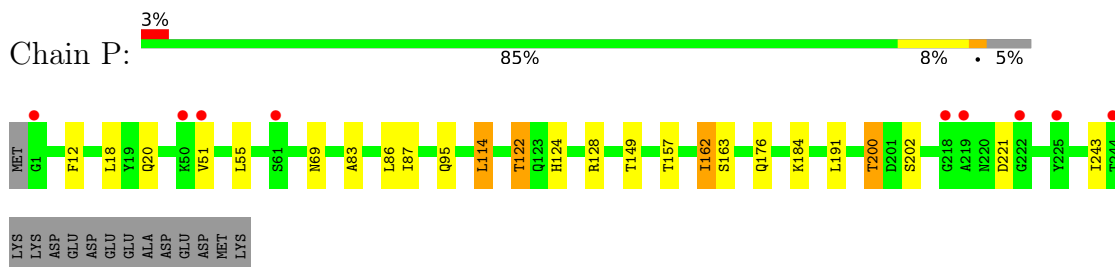
- Molecule 1: Proteasome subunit alpha type-2



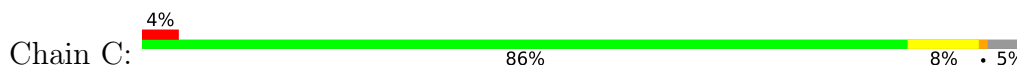
- Molecule 2: Proteasome subunit alpha type-3

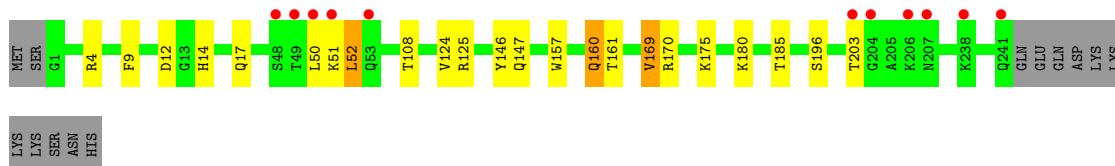


- Molecule 2: Proteasome subunit alpha type-3

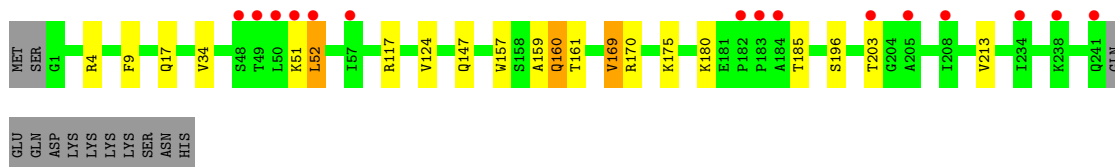
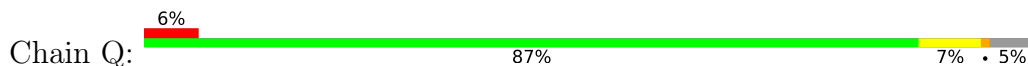


- Molecule 3: Proteasome subunit alpha type-4

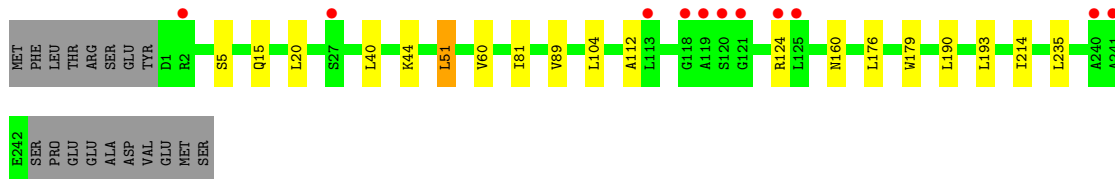
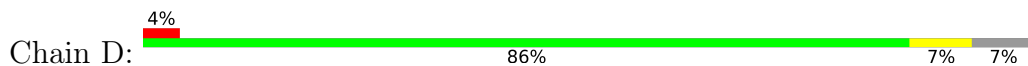




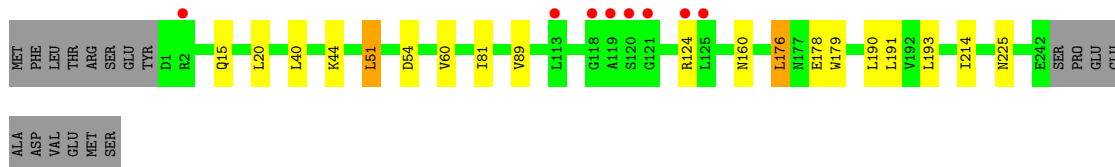
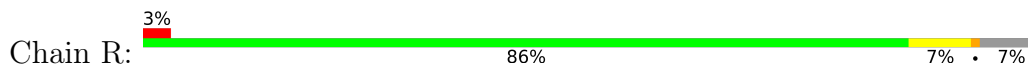
• Molecule 3: Proteasome subunit alpha type-4



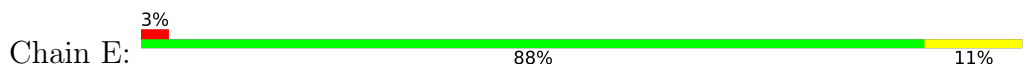
• Molecule 4: Proteasome subunit alpha type-5



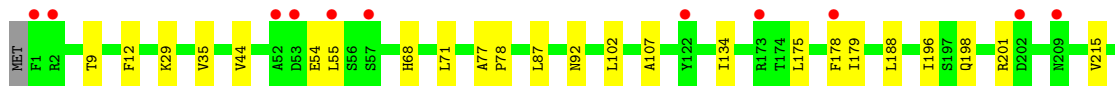
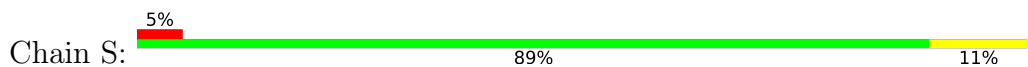
• Molecule 4: Proteasome subunit alpha type-5



• Molecule 5: Proteasome subunit alpha type-6



• Molecule 5: Proteasome subunit alpha type-6





- Molecule 9: Proteasome subunit beta type-3



- Molecule 9: Proteasome subunit beta type-3



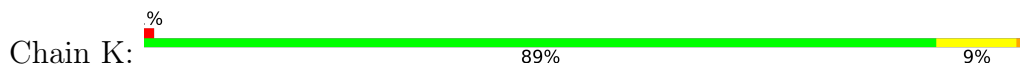
- Molecule 10: Proteasome subunit beta type-4



- Molecule 10: Proteasome subunit beta type-4



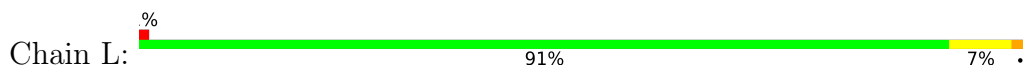
- Molecule 11: Proteasome subunit beta type-5



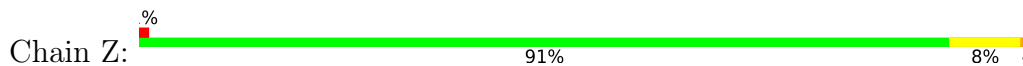
- Molecule 11: Proteasome subunit beta type-5



- Molecule 12: Proteasome subunit beta type-6



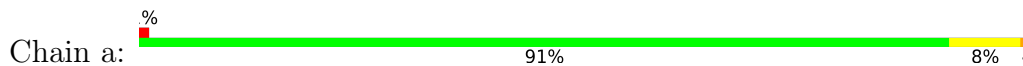
- Molecule 12: Proteasome subunit beta type-6



- Molecule 13: Proteasome subunit beta type-7



- Molecule 13: Proteasome subunit beta type-7



- Molecule 14: Proteasome subunit beta type-1



- Molecule 14: Proteasome subunit beta type-1



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	135.17Å 300.23Å 144.38Å 90.00° 112.79° 90.00°	Depositor
Resolution (Å)	15.00 – 2.50 15.00 – 2.50	Depositor EDS
% Data completeness (in resolution range)	96.8 (15.00-2.50) 96.8 (15.00-2.50)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.09 (at 2.51Å)	Xtrriage
Refinement program	REFMAC 5.7.0032	Depositor
R, R_{free}	0.204 , 0.233 0.206 , 0.233	Depositor DCC
R_{free} test set	17633 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	49.9	Xtrriage
Anisotropy	0.144	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 45.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	52219	wwPDB-VP
Average B, all atoms (Å ²)	57.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.40% 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: EC6

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	0.69	0/2642
1	O	0.40	0/1952	0.70	0/2642
2	B	0.41	0/1934	0.69	0/2618
2	P	0.40	0/1934	0.67	0/2618
3	C	0.40	0/1919	0.70	0/2598
3	Q	0.41	0/1919	0.69	0/2598
4	D	0.39	0/1886	0.66	0/2541
4	R	0.39	0/1886	0.66	0/2541
5	E	0.39	0/1823	0.66	0/2463
5	S	0.39	0/1823	0.63	0/2463
6	F	0.42	0/1936	0.69	0/2614
6	T	0.40	0/1936	0.69	0/2614
7	G	0.40	0/1959	0.67	0/2652
7	U	0.39	0/1959	0.67	0/2652
8	H	0.38	0/1715	0.67	0/2326
8	V	0.39	0/1715	0.69	0/2326
9	I	0.40	0/1611	0.69	0/2174
9	W	0.39	0/1611	0.68	0/2174
10	J	0.40	0/1613	0.64	0/2173
10	X	0.39	0/1613	0.65	0/2173
11	K	0.48	1/1681 (0.1%)	0.70	0/2274
11	Y	0.49	1/1681 (0.1%)	0.71	1/2274 (0.0%)
12	L	0.40	0/1795	0.67	0/2420
12	Z	0.40	0/1795	0.69	0/2420
13	M	0.41	0/1855	0.68	0/2514
13	a	0.40	0/1855	0.66	0/2514
14	N	0.39	0/1541	0.67	0/2087
14	b	0.38	0/1541	0.66	0/2087
All	All	0.40	2/50440 (0.0%)	0.68	1/68192 (0.0%)

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

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

Mol	Chain	#Chirality outliers	#Planarity outliers
11	K	0	1
11	Y	0	1
All	All	0	2

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
11	Y	1	THR	C-N	11.75	1.49	1.33
11	K	1	THR	C-N	11.73	1.49	1.33

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
11	Y	1	THR	CA-CB-CG2	5.07	119.12	110.50

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
11	K	1	THR	Peptide
11	Y	1	THR	Peptide

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	7	0
1	O	1915	0	1929	4	0
2	B	1904	0	1904	15	0
2	P	1904	0	1904	12	0
3	C	1890	0	1903	15	0
3	Q	1890	0	1903	12	0
4	D	1861	0	1839	7	0
4	R	1861	0	1839	7	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	E	1795	0	1800	12	0
5	S	1795	0	1800	12	0
6	F	1896	0	1889	10	0
6	T	1896	0	1889	8	0
7	G	1921	0	1913	11	0
7	U	1921	0	1913	13	0
8	H	1684	0	1688	4	0
8	V	1684	0	1688	5	0
9	I	1581	0	1574	4	0
9	W	1581	0	1574	4	0
10	J	1585	0	1590	3	0
10	X	1585	0	1590	4	0
11	K	1644	0	1592	10	0
11	Y	1644	0	1592	8	0
12	L	1757	0	1711	15	0
12	Z	1757	0	1711	13	0
13	M	1824	0	1832	9	0
13	a	1824	0	1832	9	0
14	N	1512	0	1481	2	0
14	b	1512	0	1481	4	0
15	K	37	0	52	1	0
15	Y	37	0	52	2	0
16	A	99	0	0	0	0
16	B	77	0	0	0	0
16	C	85	0	0	0	0
16	D	86	0	0	1	0
16	E	57	0	0	0	0
16	F	92	0	0	1	0
16	G	121	0	0	0	0
16	H	101	0	0	0	0
16	I	107	0	0	0	0
16	J	103	0	0	1	0
16	K	104	0	0	1	0
16	L	110	0	0	2	0
16	M	132	0	0	0	0
16	N	101	0	0	0	0
16	O	66	0	0	0	0
16	P	75	0	0	1	0
16	Q	73	0	0	1	0
16	R	85	0	0	0	0
16	S	49	0	0	0	0
16	T	89	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
16	U	110	0	0	1	0
16	V	91	0	0	1	0
16	W	104	0	0	0	0
16	X	98	0	0	2	0
16	Y	73	0	0	0	0
16	Z	102	0	0	1	0
16	a	111	0	0	0	0
16	b	106	0	0	0	0
All	All	52219	0	49394	203	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 203 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)
7:G:92:ALA:HA	7:G:103:MET:HE2	1.58	0.85
7:U:92:ALA:HA	7:U:103:MET:HE2	1.59	0.84
6:T:91:GLU:HG2	6:T:111:ARG:HB3	1.64	0.80
7:G:103:MET:HE3	7:G:108:LEU:HD13	1.71	0.71
3:C:51:LYS:O	3:C:52:LEU:HB2	1.90	0.71

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	248/250 (99%)	239 (96%)	8 (3%)	1 (0%)	30	49
1	O	248/250 (99%)	238 (96%)	9 (4%)	1 (0%)	30	49
2	B	242/258 (94%)	233 (96%)	7 (3%)	2 (1%)	16	31

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	P	242/258 (94%)	232 (96%)	8 (3%)	2 (1%)	16	31
3	C	239/254 (94%)	234 (98%)	3 (1%)	2 (1%)	16	31
3	Q	239/254 (94%)	232 (97%)	5 (2%)	2 (1%)	16	31
4	D	240/260 (92%)	234 (98%)	6 (2%)	0	100	100
4	R	240/260 (92%)	233 (97%)	7 (3%)	0	100	100
5	E	231/234 (99%)	224 (97%)	6 (3%)	1 (0%)	30	49
5	S	231/234 (99%)	222 (96%)	8 (4%)	1 (0%)	30	49
6	F	242/287 (84%)	234 (97%)	6 (2%)	2 (1%)	16	31
6	T	242/287 (84%)	233 (96%)	9 (4%)	0	100	100
7	G	241/252 (96%)	233 (97%)	6 (2%)	2 (1%)	16	31
7	U	241/252 (96%)	236 (98%)	3 (1%)	2 (1%)	16	31
8	H	220/232 (95%)	215 (98%)	5 (2%)	0	100	100
8	V	220/232 (95%)	214 (97%)	6 (3%)	0	100	100
9	I	202/205 (98%)	195 (96%)	7 (4%)	0	100	100
9	W	202/205 (98%)	197 (98%)	5 (2%)	0	100	100
10	J	196/198 (99%)	189 (96%)	7 (4%)	0	100	100
10	X	196/198 (99%)	190 (97%)	6 (3%)	0	100	100
11	K	210/212 (99%)	205 (98%)	4 (2%)	1 (0%)	24	43
11	Y	210/212 (99%)	203 (97%)	6 (3%)	1 (0%)	24	43
12	L	220/222 (99%)	214 (97%)	6 (3%)	0	100	100
12	Z	220/222 (99%)	213 (97%)	7 (3%)	0	100	100
13	M	231/233 (99%)	223 (96%)	8 (4%)	0	100	100
13	a	231/233 (99%)	223 (96%)	7 (3%)	1 (0%)	30	49
14	N	194/196 (99%)	187 (96%)	7 (4%)	0	100	100
14	b	194/196 (99%)	186 (96%)	8 (4%)	0	100	100
All	All	6312/6586 (96%)	6111 (97%)	180 (3%)	21 (0%)	36	55

5 of 21 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	52	LEU
7	G	242	GLN
3	Q	52	LEU

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Mol	Chain	Res	Type
5	E	201	ARG
7	G	2	GLY

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	209/209 (100%)	205 (98%)	4 (2%)	50	76
1	O	209/209 (100%)	206 (99%)	3 (1%)	59	81
2	B	203/216 (94%)	192 (95%)	11 (5%)	20	41
2	P	203/216 (94%)	192 (95%)	11 (5%)	20	41
3	C	213/226 (94%)	206 (97%)	7 (3%)	33	61
3	Q	213/226 (94%)	205 (96%)	8 (4%)	29	56
4	D	198/215 (92%)	187 (94%)	11 (6%)	19	39
4	R	198/215 (92%)	187 (94%)	11 (6%)	19	39
5	E	192/193 (100%)	183 (95%)	9 (5%)	23	47
5	S	192/193 (100%)	185 (96%)	7 (4%)	31	58
6	F	201/238 (84%)	190 (94%)	11 (6%)	19	40
6	T	201/238 (84%)	191 (95%)	10 (5%)	22	44
7	G	207/210 (99%)	200 (97%)	7 (3%)	32	60
7	U	207/210 (99%)	200 (97%)	7 (3%)	32	60
8	H	181/190 (95%)	177 (98%)	4 (2%)	45	73
8	V	181/190 (95%)	176 (97%)	5 (3%)	38	66
9	I	172/173 (99%)	168 (98%)	4 (2%)	44	72
9	W	172/173 (99%)	168 (98%)	4 (2%)	44	72
10	J	175/175 (100%)	170 (97%)	5 (3%)	37	65
10	X	175/175 (100%)	170 (97%)	5 (3%)	37	65
11	K	169/169 (100%)	159 (94%)	10 (6%)	18	37
11	Y	169/169 (100%)	161 (95%)	8 (5%)	23	47

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
12	L	185/185 (100%)	178 (96%)	7 (4%)	29	56
12	Z	185/185 (100%)	179 (97%)	6 (3%)	34	62
13	M	199/199 (100%)	192 (96%)	7 (4%)	32	58
13	a	199/199 (100%)	192 (96%)	7 (4%)	32	58
14	N	162/162 (100%)	157 (97%)	5 (3%)	35	62
14	b	162/162 (100%)	157 (97%)	5 (3%)	35	62
All	All	5332/5520 (97%)	5133 (96%)	199 (4%)	30	57

5 of 199 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
7	U	235	ARG
12	L	49	ASN
8	H	68	LEU
11	K	4	LEU
13	M	170	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 166 such sidechains are listed below:

Mol	Chain	Res	Type
12	L	158	ASN
10	X	147	HIS
13	M	48	ASN
8	V	66	HIS
12	Z	49	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry

2 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
15	EC6	K	301	11	36,36,36	1.44	3 (8%)	45,47,47	1.63	8 (17%)
15	EC6	Y	301	11	36,36,36	1.37	3 (8%)	45,47,47	1.51	7 (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
15	EC6	K	301	11	-	17/52/52/52	-
15	EC6	Y	301	11	-	20/52/52/52	-

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
15	K	301	EC6	C17-C16	4.55	1.61	1.53
15	Y	301	EC6	C17-C16	4.01	1.60	1.53
15	K	301	EC6	C12-C11	3.79	1.58	1.53
15	Y	301	EC6	C12-C11	3.70	1.58	1.53
15	K	301	EC6	C16-C11	3.44	1.59	1.53

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
15	Y	301	EC6	O3-C5-C2	-4.22	112.19	120.75
15	K	301	EC6	O3-C5-C2	-3.95	112.72	120.75
15	K	301	EC6	C12-C11-N3	-3.67	105.49	110.20
15	K	301	EC6	O1-C1-C27	-3.18	116.25	122.02
15	Y	301	EC6	C11-N3-C10	-3.13	117.80	123.25

There are no chirality outliers.

5 of 37 torsion outliers are listed below:

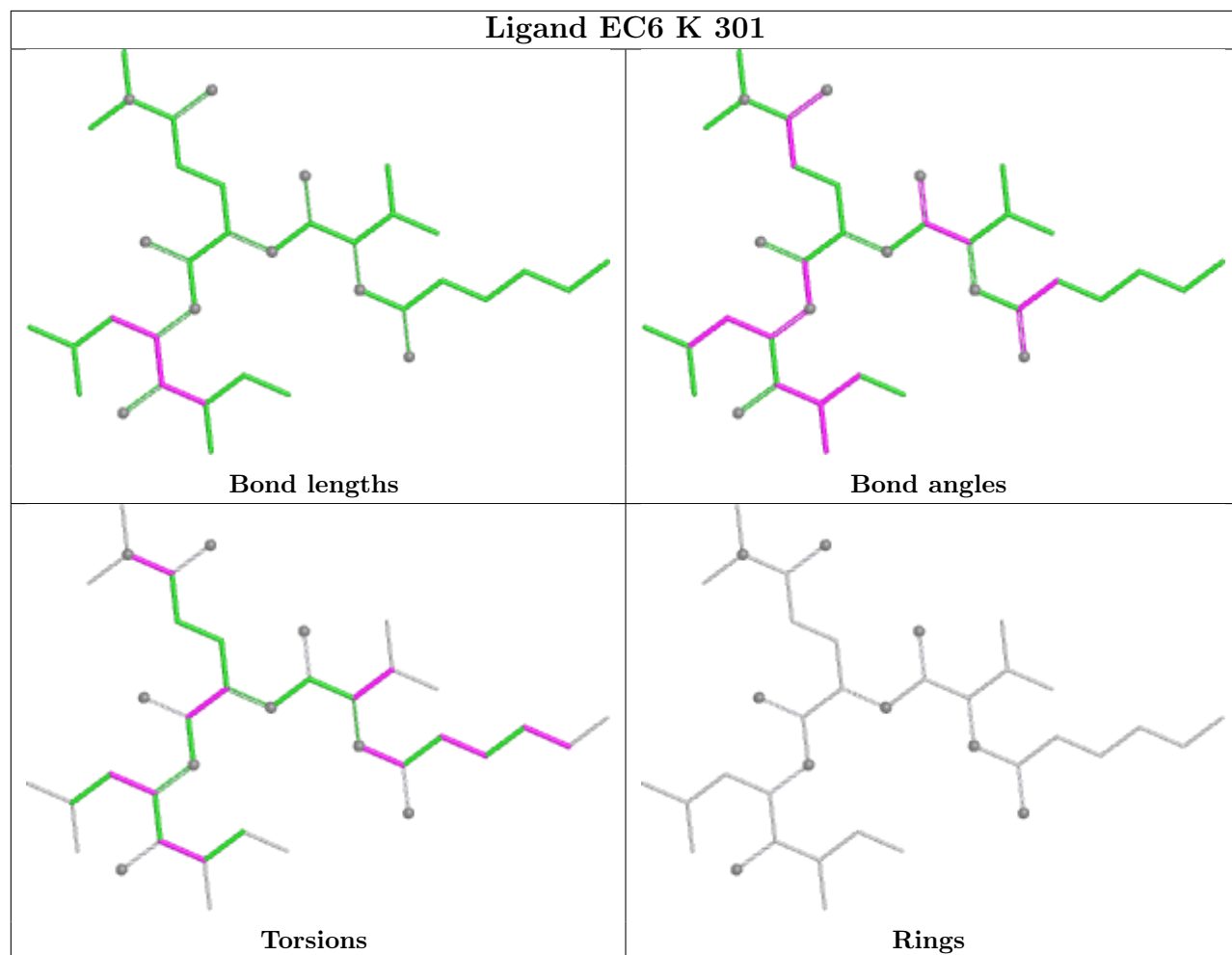
Mol	Chain	Res	Type	Atoms
15	K	301	EC6	C8-C9-N5-C24
15	K	301	EC6	C16-C11-C12-C13
15	K	301	EC6	C11-C16-C17-C23
15	K	301	EC6	C11-C16-C17-C18
15	Y	301	EC6	O1-C1-N1-C2

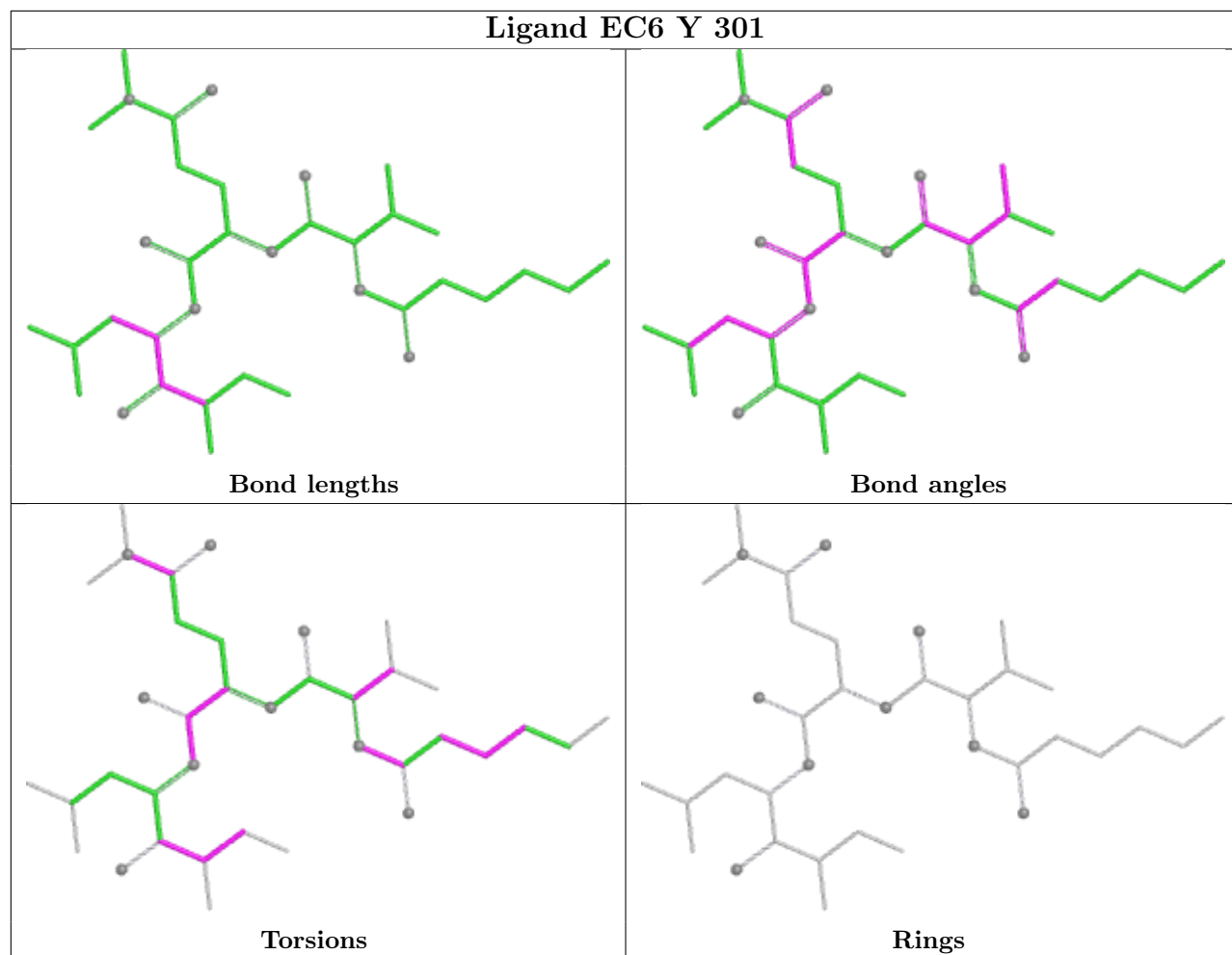
There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
15	K	301	EC6	1	0
15	Y	301	EC6	2	0

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





5.7 Other polymers [\(i\)](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [\(i\)](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	250/250 (100%)	-0.21	2 (0%) 82 80	38, 50, 81, 128	0
1	O	250/250 (100%)	-0.12	5 (2%) 65 61	43, 57, 94, 127	0
2	B	244/258 (94%)	0.01	11 (4%) 38 33	39, 55, 99, 138	0
2	P	244/258 (94%)	0.12	9 (3%) 45 40	45, 58, 100, 146	0
3	C	241/254 (94%)	0.09	11 (4%) 37 33	39, 58, 114, 137	0
3	Q	241/254 (94%)	0.33	15 (6%) 26 23	48, 69, 133, 150	0
4	D	242/260 (93%)	0.06	11 (4%) 38 33	41, 59, 107, 145	0
4	R	242/260 (93%)	0.08	8 (3%) 49 45	44, 62, 102, 149	0
5	E	233/234 (99%)	0.01	6 (2%) 57 52	44, 58, 85, 123	0
5	S	233/234 (99%)	0.35	11 (4%) 36 32	48, 70, 100, 123	0
6	F	244/287 (85%)	-0.14	4 (1%) 70 67	38, 55, 92, 121	0
6	T	244/287 (85%)	0.05	5 (2%) 65 61	47, 63, 103, 130	0
7	G	243/252 (96%)	-0.19	4 (1%) 70 67	37, 51, 84, 135	0
7	U	243/252 (96%)	-0.14	4 (1%) 70 67	43, 55, 80, 121	0
8	H	222/232 (95%)	-0.21	1 (0%) 87 85	37, 48, 68, 113	0
8	V	222/232 (95%)	-0.20	1 (0%) 87 85	39, 50, 74, 125	0
9	I	204/205 (99%)	-0.43	2 (0%) 79 76	32, 46, 64, 90	0
9	W	204/205 (99%)	-0.39	1 (0%) 87 85	36, 48, 69, 87	0
10	J	198/198 (100%)	-0.26	5 (2%) 58 54	38, 49, 68, 143	0
10	X	198/198 (100%)	-0.20	6 (3%) 52 48	40, 52, 71, 148	0
11	K	212/212 (100%)	-0.27	2 (0%) 81 78	36, 49, 73, 85	0
11	Y	212/212 (100%)	-0.26	1 (0%) 87 85	38, 50, 76, 91	0
12	L	222/222 (100%)	-0.25	3 (1%) 73 70	36, 48, 73, 102	0
12	Z	222/222 (100%)	-0.25	3 (1%) 73 70	36, 49, 72, 99	0

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
13	M	233/233 (100%)	-0.37	1 (0%) 88 86	34, 48, 63, 77	0
13	a	233/233 (100%)	-0.33	2 (0%) 81 78	36, 49, 65, 80	0
14	N	196/196 (100%)	-0.39	0 100 100	37, 44, 65, 91	0
14	b	196/196 (100%)	-0.39	0 100 100	37, 46, 65, 87	0
All	All	6368/6586 (96%)	-0.13	134 (2%) 63 59	32, 53, 93, 150	0

The worst 5 of 134 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	D	118	GLY	9.6
4	D	119	ALA	7.1
4	R	119	ALA	6.9
12	L	174	TYR	6.6
3	C	50	LEU	6.2

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

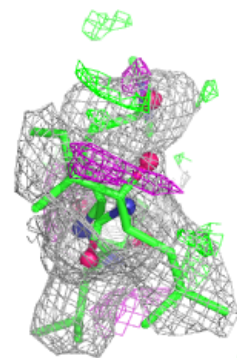
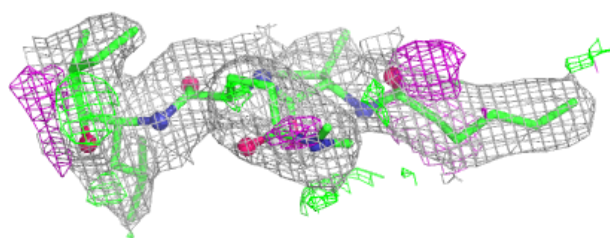
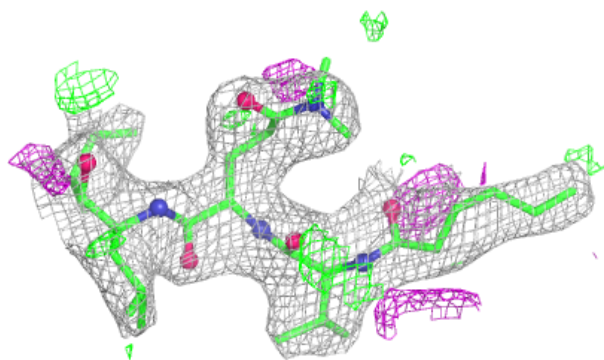
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
15	EC6	Y	301	37/37	0.86	0.12	52,59,75,76	0
15	EC6	K	301	37/37	0.89	0.12	47,54,69,69	0

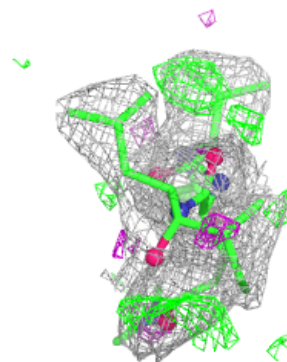
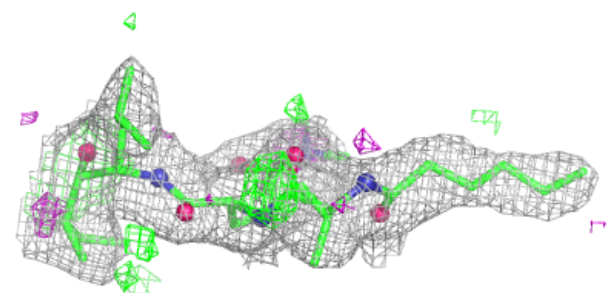
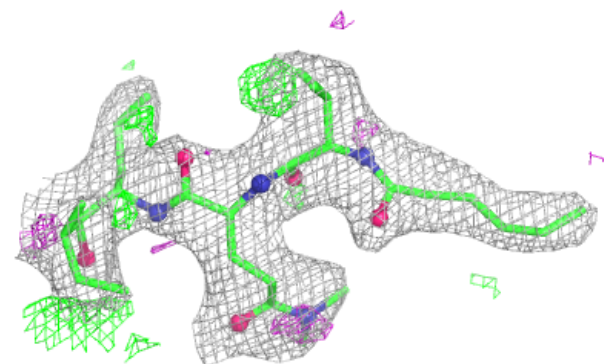
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around EC6 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 EC6 K 301:**

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



6.5 Other polymers [i](#)

There are no such residues in this entry.