



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 30, 2026 – 01:32 PM UTC

PDB ID : 9FT1 / pdb\_00009ft1  
Title : Yeast 20S proteasome in complex with epoxyketone inhibitor 9  
Authors : Maurits, E.; Huber, E.M.; Dekker, P.M.; Wang, X.; Heinemeyer, W.; Florea, B.I.; Groll, M.; Overkleeft, H.S.  
Deposited on : 2024-06-23  
Resolution : 2.60 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](mailto:validation@mail.wwpdb.org)

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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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

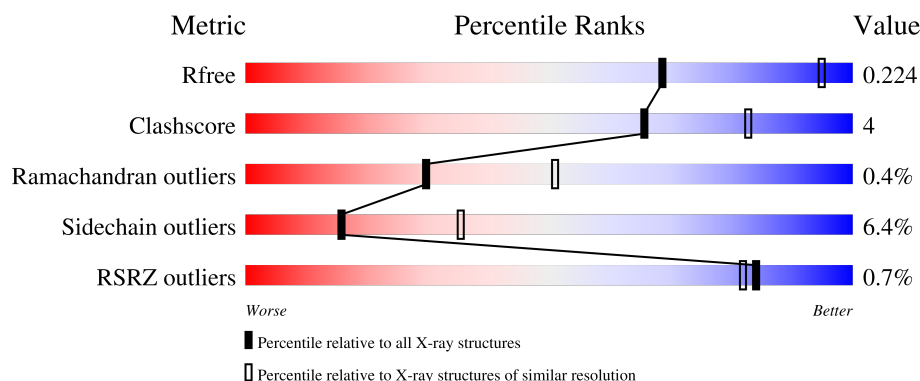
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.60 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	180053	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (2.60-2.60)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	250	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 1%, orange 1%, yellow 1%, green 98%);"></div> <div style="display: flex; justify-content: space-between; width: 90%; margin: 0 auto;"> <span>%</span> <span>92%</span> <span>7%</span> </div> </div>
1	O	250	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, green 91%, yellow 8%, orange 1%, red 1%);"></div> <div style="display: flex; justify-content: space-between; width: 90%; margin: 0 auto;"> <span>91%</span> <span>8%</span> </div> </div>
2	B	258	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 2%, orange 1%, yellow 14%, green 79%, grey 4%);"></div> <div style="display: flex; justify-content: space-between; width: 90%; margin: 0 auto;"> <span>2%</span> <span>79%</span> <span>14%</span> <span>5%</span> </div> </div>
2	P	258	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 3%, orange 1%, yellow 13%, green 81%, grey 3%);"></div> <div style="display: flex; justify-content: space-between; width: 90%; margin: 0 auto;"> <span>3%</span> <span>81%</span> <span>13%</span> <span>5%</span> </div> </div>
3	C	254	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 1%, orange 1%, yellow 10%, green 82%, grey 6%);"></div> <div style="display: flex; justify-content: space-between; width: 90%; margin: 0 auto;"> <span>%</span> <span>82%</span> <span>10%</span> <span>6%</span> </div> </div>

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Mol	Chain	Length	Quality of chain
3	Q	254	 2% 82% 10% • 6%
4	D	260	 % 77% 13% 10%
4	R	260	 % 76% 14% 10%
5	E	234	 79% 17% • •
5	S	234	 % 80% 16% • •
6	F	288	 75% 8% • 16%
6	T	288	 % 75% 8% • 16%
7	G	252	 % 81% 13% • •
7	U	252	 82% 13% • •
8	H	231	 84% 12% •
8	V	231	 85% 11% •
9	I	205	 86% 13%
9	W	205	 85% 14%
10	J	198	 % 86% 11% • •
10	X	198	 % 86% 11% • •
11	K	211	 90% 8% •
11	Y	211	 90% 8% •
12	L	222	 86% 12% •
12	Z	222	 87% 12% •
13	M	246	 % 83% 11% • 5%
13	a	246	 % 80% 14% • 5%
14	N	196	 92% 8% •
14	b	196	 90% 9% •

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
16	MES	b	201	-	-	X	X

## 2 Entry composition

There are 18 unique types of molecules in this entry. The entry contains 49970 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	221	Total	C	N	O	S	0	0	0
			1677	1057	292	321	7			
8	V	221	Total	C	N	O	S	0	0	0
			1677	1057	292	321	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	211	Total	C	N	O	S	0	0	0
			1637	1041	279	310	7			
11	Y	211	Total	C	N	O	S	0	0	0
			1637	1041	279	310	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).

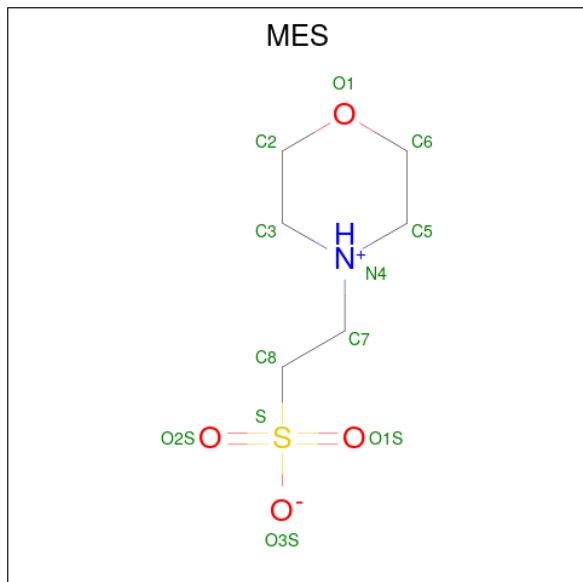
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
15	G	1	Total	Mg	0	0
			1	1		
15	H	1	Total	Mg	0	0
			1	1		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
15	I	1	Total	Mg	0	0
			1	1		
15	K	1	Total	Mg	0	0
			1	1		
15	N	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 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: C<sub>6</sub>H<sub>13</sub>NO<sub>4</sub>S).

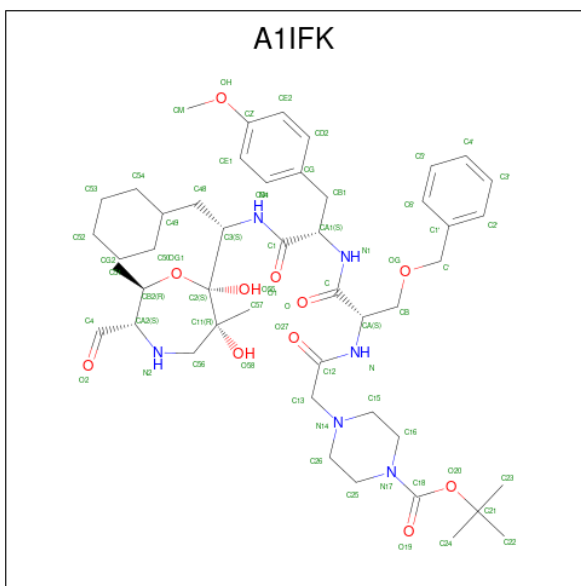


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
16	H	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
16	J	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
16	V	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
16	X	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
16	b	1	Total	C	N	O	S	0	0
			12	6	1	4	1		

- Molecule 17 is tert-butyl 4-[2-[[[(2S)-1-[[[(2S)-1-[[[(1S)-2-cyclohexyl-1-[(2R,3S,6R,7S)-3-meth



anoyl-2,6-dimethyl-6,7-bis(oxidanyl)-1,4-oxazepan-7-yl]ethyl]amino]-3-(4-methoxyphenyl)-1-oxidanylidene-propan-2-yl]amino]-1-oxidanylidene-3-phenylmethoxy-propan-2-yl]amino]-2-oxidanylidene-ethyl]piperazine-1-carboxylate (CCD ID: A1IFK) (formula:  $C_{47}H_{70}N_6O_{11}$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
17	H	1	Total	C	N	O	0	0
			64	47	6	11		
17	K	1	Total	C	N	O	0	0
			64	47	6	11		
17	V	1	Total	C	N	O	0	0
			64	47	6	11		
17	Y	1	Total	C	N	O	0	0
			64	47	6	11		

- Molecule 18 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
18	A	14	Total	O	0	0
			14	14		
18	B	14	Total	O	0	0
			14	14		
18	C	11	Total	O	0	0
			11	11		
18	D	11	Total	O	0	0
			11	11		
18	E	5	Total	O	0	0
			5	5		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
18	F	11	Total O 11 11	0	0
18	G	13	Total O 13 13	0	0
18	H	18	Total O 18 18	0	0
18	I	17	Total O 17 17	0	0
18	J	19	Total O 19 19	0	0
18	K	18	Total O 18 18	0	0
18	L	22	Total O 22 22	0	0
18	M	16	Total O 16 16	0	0
18	N	14	Total O 14 14	0	0
18	O	15	Total O 15 15	0	0
18	P	11	Total O 11 11	0	0
18	Q	8	Total O 8 8	0	0
18	R	7	Total O 7 7	0	0
18	S	5	Total O 5 5	0	0
18	T	7	Total O 7 7	0	0
18	U	20	Total O 20 20	0	0
18	V	10	Total O 10 10	0	0
18	W	16	Total O 16 16	0	0
18	X	15	Total O 15 15	0	0
18	Y	15	Total O 15 15	0	0
18	Z	14	Total O 14 14	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
18	a	15	Total	O	0	0
			15	15		
18	b	18	Total	O	0	0
			18	18		

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

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

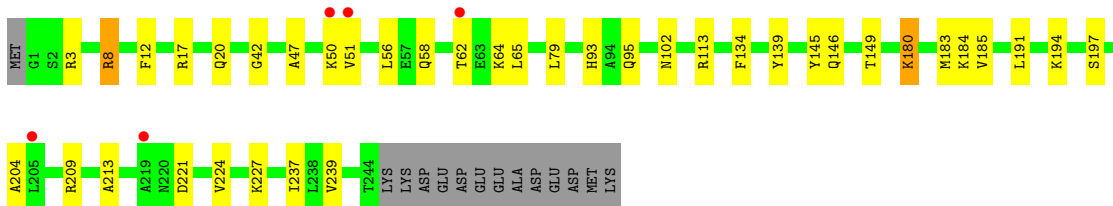
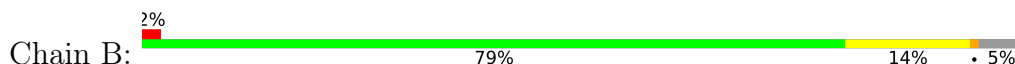
- Molecule 1: Proteasome subunit alpha type-2



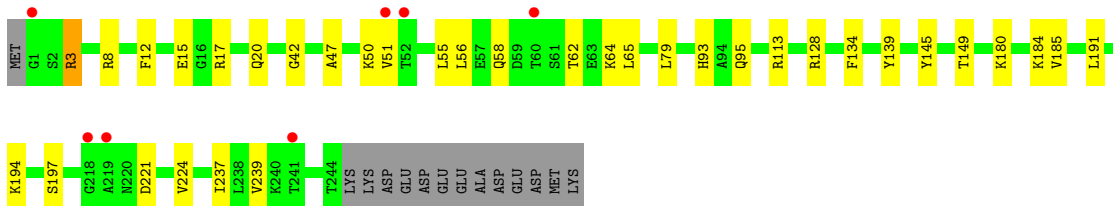
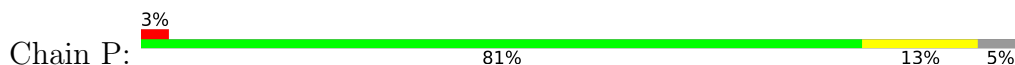
- Molecule 1: Proteasome subunit alpha type-2



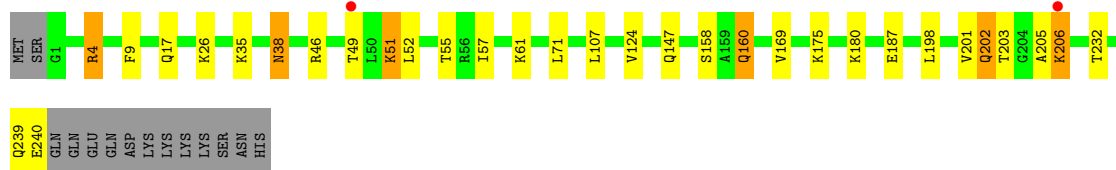
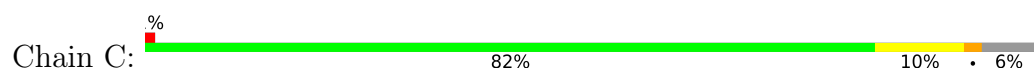
- Molecule 2: Proteasome subunit alpha type-3



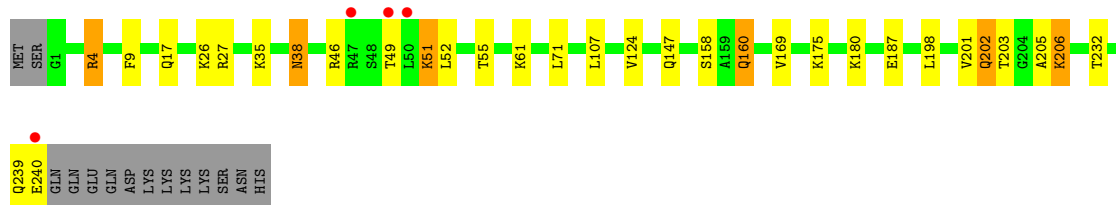
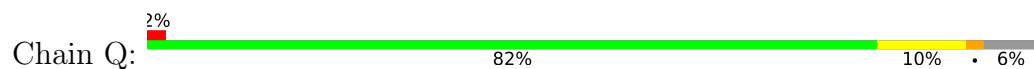
- Molecule 2: Proteasome subunit alpha type-3



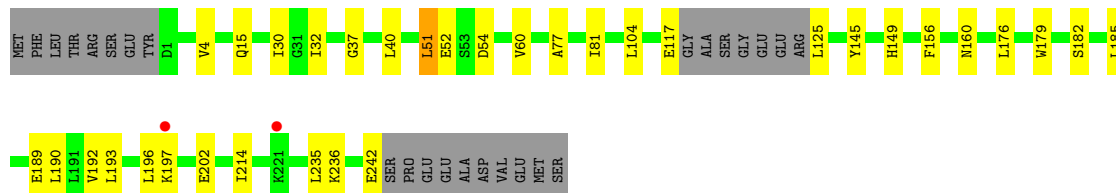
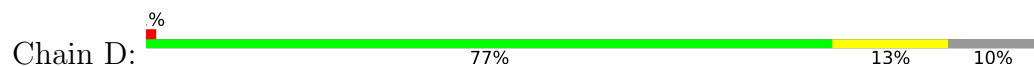
- Molecule 3: Proteasome subunit alpha type-4



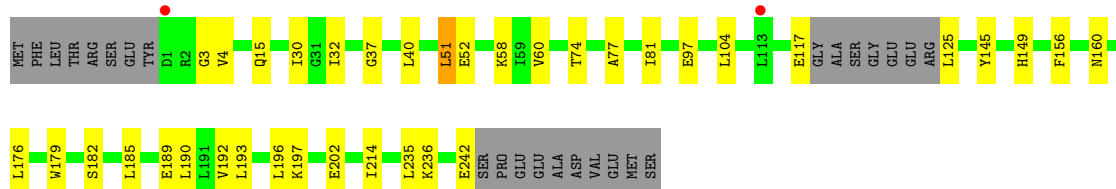
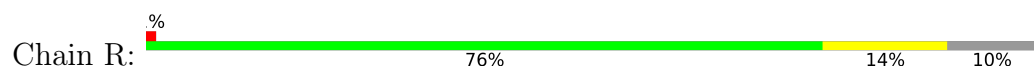
• Molecule 3: Proteasome subunit alpha type-4



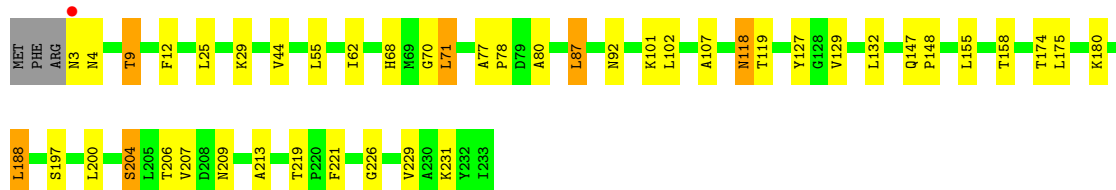
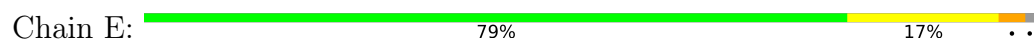
• Molecule 4: Proteasome subunit alpha type-5



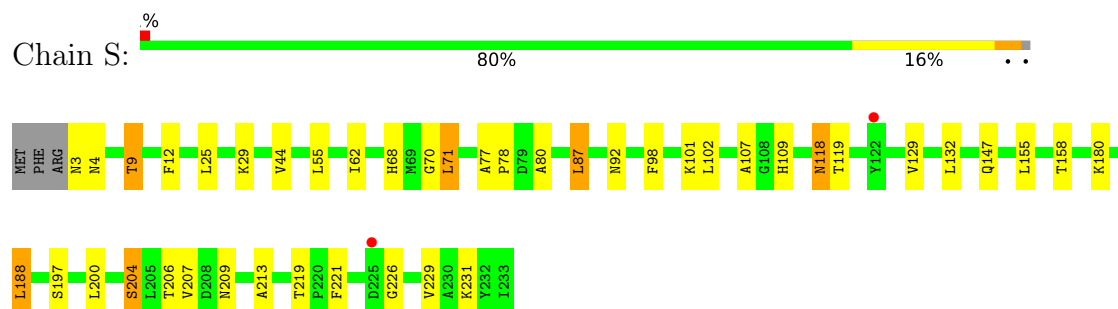
• Molecule 4: Proteasome subunit alpha type-5



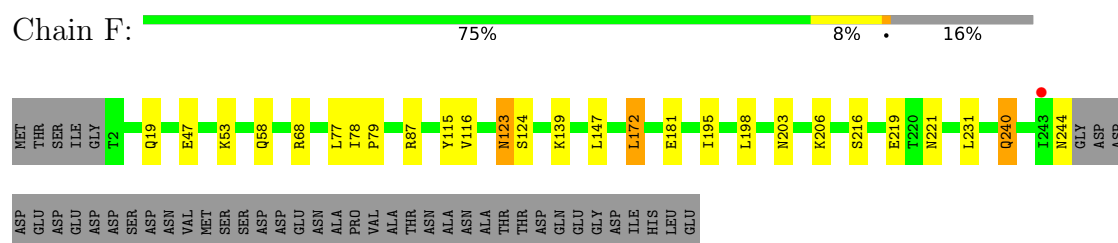
• Molecule 5: Proteasome subunit alpha type-6



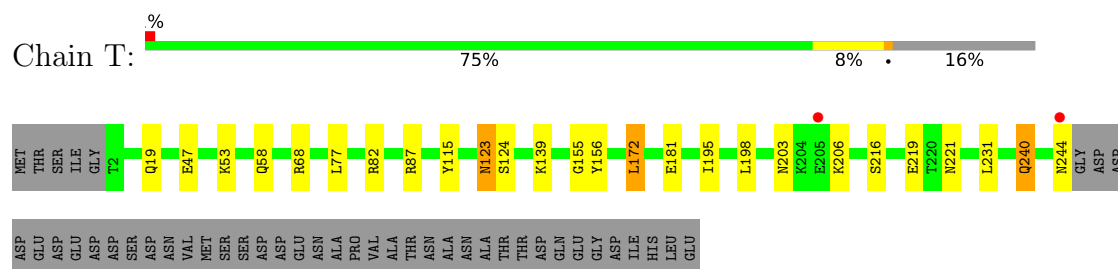
- Molecule 5: Proteasome subunit alpha type-6



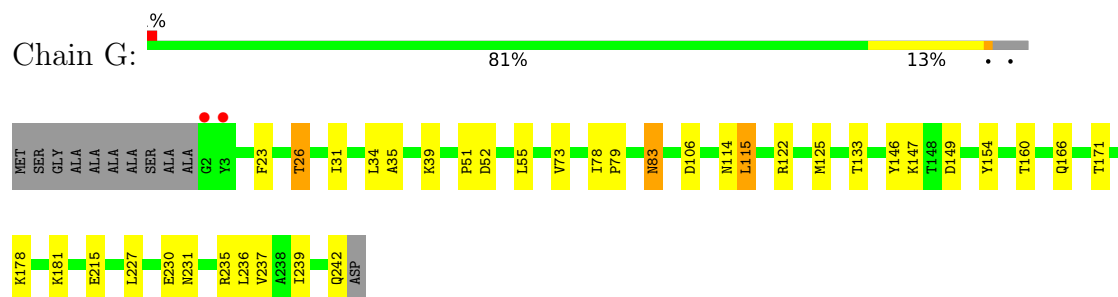
- Molecule 6: Probable proteasome subunit alpha type-7



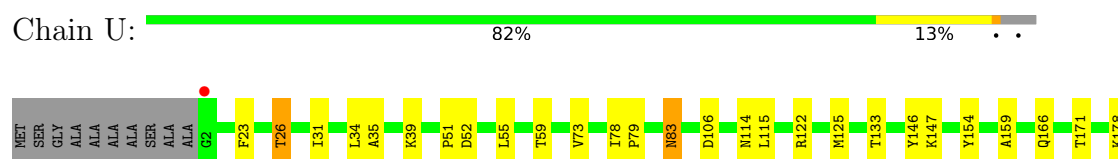
- Molecule 6: Probable proteasome subunit alpha type-7



- Molecule 7: Proteasome subunit alpha type-1

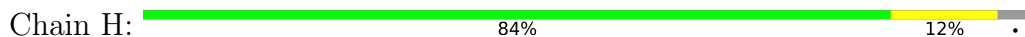


- Molecule 7: Proteasome subunit alpha type-1

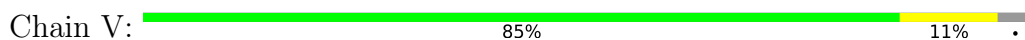




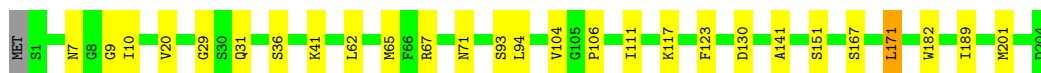
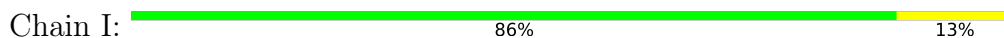
- Molecule 8: Proteasome subunit beta type-2



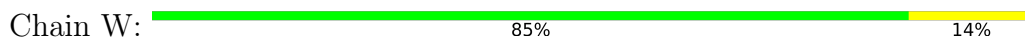
- Molecule 8: Proteasome subunit beta type-2



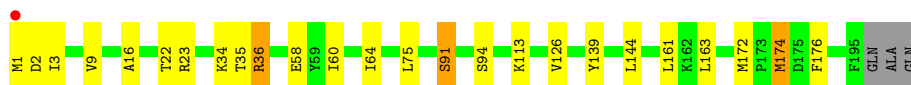
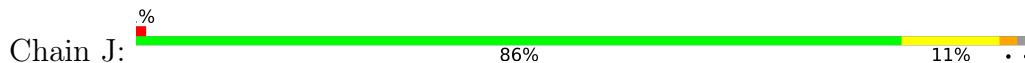
- Molecule 9: Proteasome subunit beta type-3



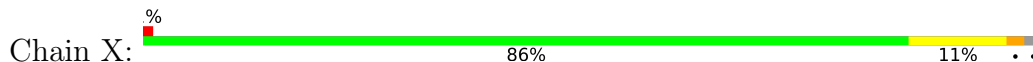
- Molecule 9: Proteasome subunit beta type-3

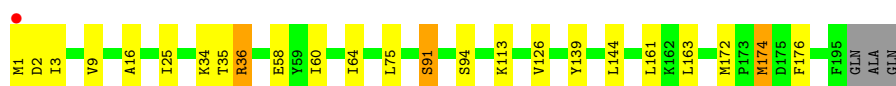


- Molecule 10: Proteasome subunit beta type-4

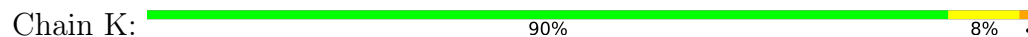


- Molecule 10: Proteasome subunit beta type-4





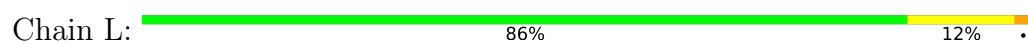
- Molecule 11: Proteasome subunit beta type-5



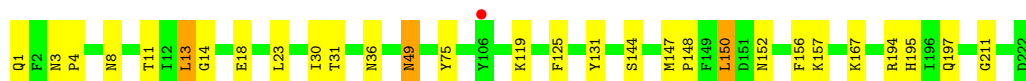
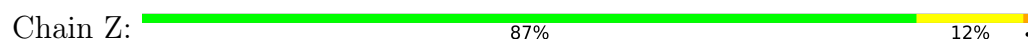
- Molecule 11: Proteasome subunit beta type-5



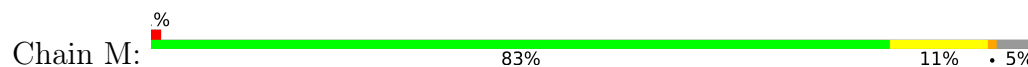
- Molecule 12: Proteasome subunit beta type-6



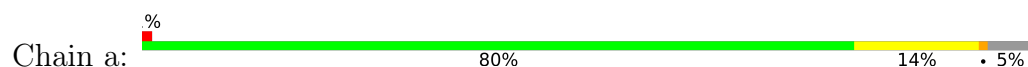
- Molecule 12: Proteasome subunit beta type-6



- Molecule 13: Proteasome subunit beta type-7



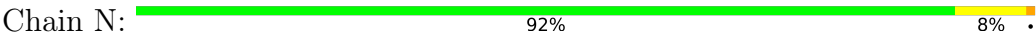
- Molecule 13: Proteasome subunit beta type-7



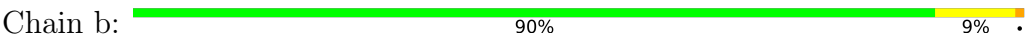




● Molecule 14: Proteasome subunit beta type-1



● 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, $\alpha$ , $\beta$ , $\gamma$	136.00Å 300.67Å 144.54Å 90.00° 113.09° 90.00°	Depositor
Resolution (Å)	30.00 – 2.60 30.00 – 2.60	Depositor EDS
% Data completeness (in resolution range)	97.4 (30.00-2.60) 97.4 (30.00-2.60)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.16 (at 2.61Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, $R_{free}$	0.182 , 0.222 0.176 , 0.224	Depositor DCC
$R_{free}$ test set	15884 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	37.4	Xtriage
Anisotropy	1.388	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.29 , 52.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	49970	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	67.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.27% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MG, MES, A1IFK

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	1.02	0/1952	1.39	0/2642
1	O	1.03	0/1952	1.40	0/2642
2	B	1.02	0/1934	1.40	0/2618
2	P	1.02	0/1934	1.41	0/2618
3	C	1.03	0/1910	1.43	0/2586
3	Q	1.04	0/1910	1.44	0/2586
4	D	1.03	0/1837	1.44	0/2475
4	R	1.03	0/1837	1.43	0/2475
5	E	1.03	0/1800	1.40	0/2433
5	S	1.03	0/1800	1.40	0/2433
6	F	1.02	0/1932	1.40	2/2609 (0.1%)
6	T	1.03	0/1932	1.42	2/2609 (0.1%)
7	G	1.01	1/1945 (0.1%)	1.42	0/2634
7	U	1.02	0/1945	1.41	0/2634
8	H	1.02	0/1708	1.38	0/2316
8	V	1.03	0/1708	1.40	0/2316
9	I	1.01	0/1611	1.38	2/2174 (0.1%)
9	W	1.00	0/1611	1.38	2/2174 (0.1%)
10	J	0.99	0/1589	1.35	1/2142 (0.0%)
10	X	0.99	0/1589	1.36	0/2142
11	K	0.99	0/1674	1.36	0/2264
11	Y	0.99	0/1674	1.36	0/2264
12	L	1.01	0/1795	1.33	0/2420
12	Z	1.00	0/1795	1.34	0/2420
13	M	1.02	0/1855	1.32	0/2514
13	a	1.02	0/1855	1.33	1/2514 (0.0%)
14	N	1.01	0/1541	1.38	0/2087
14	b	1.02	0/1541	1.39	0/2087
All	All	1.02	1/50166 (0.0%)	1.39	10/67828 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	G	149	ASP	N-CA	5.25	1.49	1.46

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	T	77	LEU	CA-C-N	5.95	123.99	120.24
6	T	77	LEU	C-N-CA	5.95	123.99	120.24
13	a	188	ASP	CA-CB-CG	5.58	118.19	112.60
6	F	77	LEU	CA-C-N	5.36	123.61	120.24
6	F	77	LEU	C-N-CA	5.36	123.61	120.24

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	7	0
1	O	1915	0	1929	10	0
2	B	1904	0	1904	14	0
2	P	1904	0	1904	15	0
3	C	1881	0	1895	19	0
3	Q	1881	0	1895	22	0
4	D	1813	0	1797	11	0
4	R	1813	0	1797	14	0
5	E	1773	0	1775	23	0
5	S	1773	0	1775	23	0
6	F	1892	0	1883	10	0
6	T	1892	0	1883	10	0
7	G	1907	0	1901	16	0
7	U	1907	0	1901	18	0
8	H	1677	0	1678	11	0
8	V	1677	0	1678	10	0
9	I	1581	0	1574	19	0
9	W	1581	0	1574	22	0
10	J	1561	0	1569	10	0
10	X	1561	0	1569	11	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
11	K	1637	0	1585	17	0
11	Y	1637	0	1585	20	0
12	L	1757	0	1711	17	0
12	Z	1757	0	1711	16	0
13	M	1824	0	1832	10	0
13	a	1824	0	1832	16	0
14	N	1512	0	1481	9	0
14	b	1512	0	1481	22	0
15	G	1	0	0	0	0
15	H	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	Y	1	0	0	0	0
15	Z	1	0	0	0	0
16	H	12	0	13	0	0
16	J	12	0	13	0	0
16	V	12	0	13	0	0
16	X	12	0	13	1	0
16	b	12	0	13	12	0
17	H	64	0	0	6	0
17	K	64	0	0	2	0
17	V	64	0	0	5	0
17	Y	64	0	0	4	0
18	A	14	0	0	0	0
18	B	14	0	0	0	0
18	C	11	0	0	0	0
18	D	11	0	0	0	0
18	E	5	0	0	0	0
18	F	11	0	0	0	0
18	G	13	0	0	0	0
18	H	18	0	0	0	0
18	I	17	0	0	0	0
18	J	19	0	0	0	0
18	K	18	0	0	0	0
18	L	22	0	0	0	0
18	M	16	0	0	0	0
18	N	14	0	0	0	0
18	O	15	0	0	0	0
18	P	11	0	0	0	0
18	Q	8	0	0	1	0
18	R	7	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
18	S	5	0	0	0	0
18	T	7	0	0	0	0
18	U	20	0	0	0	0
18	V	10	0	0	0	0
18	W	16	0	0	0	0
18	X	15	0	0	0	0
18	Y	15	0	0	0	0
18	Z	14	0	0	0	0
18	a	15	0	0	0	0
18	b	18	0	0	1	0
All	All	49970	0	49093	375	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 4.

The worst 5 of 375 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)
14:b:115:LEU:CD1	16:b:201:MES:H62	1.54	1.36
11:K:73:ARG:HH21	11:K:73:ARG:HG3	1.12	1.12
14:b:115:LEU:HD13	16:b:201:MES:H62	1.23	1.12
14:b:115:LEU:HD11	16:b:201:MES:H62	1.29	1.03
14:b:115:LEU:CD1	16:b:201:MES:C6	2.41	0.98

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%)	5 (2%)	3 (1%)	10 23
1	O	248/250 (99%)	240 (97%)	5 (2%)	3 (1%)	10 23

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	242/258 (94%)	234 (97%)	6 (2%)	2 (1%)	16	34
2	P	242/258 (94%)	234 (97%)	6 (2%)	2 (1%)	16	34
3	C	238/254 (94%)	225 (94%)	10 (4%)	3 (1%)	9	21
3	Q	238/254 (94%)	225 (94%)	10 (4%)	3 (1%)	9	21
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%)	217 (95%)	12 (5%)	0	100	100
5	S	229/234 (98%)	216 (94%)	13 (6%)	0	100	100
6	F	241/288 (84%)	232 (96%)	8 (3%)	1 (0%)	30	51
6	T	241/288 (84%)	232 (96%)	8 (3%)	1 (0%)	30	51
7	G	239/252 (95%)	231 (97%)	7 (3%)	1 (0%)	30	51
7	U	239/252 (95%)	229 (96%)	9 (4%)	1 (0%)	30	51
8	H	219/231 (95%)	215 (98%)	4 (2%)	0	100	100
8	V	219/231 (95%)	215 (98%)	4 (2%)	0	100	100
9	I	202/205 (98%)	194 (96%)	8 (4%)	0	100	100
9	W	202/205 (98%)	193 (96%)	9 (4%)	0	100	100
10	J	193/198 (98%)	190 (98%)	1 (0%)	2 (1%)	12	28
10	X	193/198 (98%)	190 (98%)	1 (0%)	2 (1%)	12	28
11	K	209/211 (99%)	202 (97%)	7 (3%)	0	100	100
11	Y	209/211 (99%)	202 (97%)	7 (3%)	0	100	100
12	L	220/222 (99%)	215 (98%)	5 (2%)	0	100	100
12	Z	220/222 (99%)	215 (98%)	5 (2%)	0	100	100
13	M	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%)	188 (97%)	6 (3%)	0	100	100
14	b	194/196 (99%)	188 (97%)	6 (3%)	0	100	100
All	All	6272/6610 (95%)	6061 (97%)	187 (3%)	24 (0%)	30	51

5 of 24 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	202	GLN
6	F	203	ASN

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Mol	Chain	Res	Type
3	Q	202	GLN
6	T	203	ASN
3	C	239	GLN

### 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%)	201 (96%)	8 (4%)	29	56
1	O	209/209 (100%)	201 (96%)	8 (4%)	29	56
2	B	203/216 (94%)	185 (91%)	18 (9%)	9	20
2	P	203/216 (94%)	187 (92%)	16 (8%)	11	26
3	C	212/226 (94%)	195 (92%)	17 (8%)	11	25
3	Q	212/226 (94%)	195 (92%)	17 (8%)	11	25
4	D	194/215 (90%)	177 (91%)	17 (9%)	9	21
4	R	194/215 (90%)	178 (92%)	16 (8%)	10	24
5	E	190/193 (98%)	173 (91%)	17 (9%)	9	20
5	S	190/193 (98%)	173 (91%)	17 (9%)	9	20
6	F	201/239 (84%)	187 (93%)	14 (7%)	14	31
6	T	201/239 (84%)	187 (93%)	14 (7%)	14	31
7	G	206/210 (98%)	189 (92%)	17 (8%)	10	23
7	U	206/210 (98%)	190 (92%)	16 (8%)	11	26
8	H	180/189 (95%)	168 (93%)	12 (7%)	15	33
8	V	180/189 (95%)	168 (93%)	12 (7%)	15	33
9	I	172/173 (99%)	166 (96%)	6 (4%)	32	59
9	W	172/173 (99%)	166 (96%)	6 (4%)	32	59
10	J	173/175 (99%)	164 (95%)	9 (5%)	21	44
10	X	173/175 (99%)	165 (95%)	8 (5%)	24	49
11	K	168/168 (100%)	161 (96%)	7 (4%)	26	52

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
11	Y	168/168 (100%)	160 (95%)	8 (5%)	23	47
12	L	185/185 (100%)	176 (95%)	9 (5%)	22	47
12	Z	185/185 (100%)	177 (96%)	8 (4%)	26	51
13	M	199/208 (96%)	183 (92%)	16 (8%)	11	25
13	a	199/208 (96%)	183 (92%)	16 (8%)	11	25
14	N	162/162 (100%)	157 (97%)	5 (3%)	35	63
14	b	162/162 (100%)	157 (97%)	5 (3%)	35	63
All	All	5308/5536 (96%)	4969 (94%)	339 (6%)	16	35

5 of 339 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
5	S	9	THR
8	V	196	ARG
5	S	118	ASN
7	U	26	THR
10	X	163	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 186 such sidechains are listed below:

Mol	Chain	Res	Type
4	R	198	GLN
8	V	30	ASN
5	S	68	HIS
6	T	123	ASN
9	W	37	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 16 ligands modelled in this entry, 7 are monoatomic - leaving 9 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	A1IFK	K	302	11	63,68,68	2.00	14 (22%)	79,96,96	1.36	8 (10%)
16	MES	V	301	-	12,12,12	0.72	0	15,16,16	0.35	0
16	MES	H	301	-	12,12,12	0.71	0	15,16,16	0.32	0
17	A1IFK	H	303	8	63,68,68	1.79	8 (12%)	79,96,96	1.55	11 (13%)
16	MES	J	201	-	12,12,12	0.77	0	15,16,16	0.45	0
17	A1IFK	V	302	8	63,68,68	1.80	8 (12%)	79,96,96	1.58	14 (17%)
16	MES	X	201	-	12,12,12	0.73	0	15,16,16	0.32	0
16	MES	b	201	-	12,12,12	0.81	0	15,16,16	0.70	1 (6%)
17	A1IFK	Y	302	11	63,68,68	2.12	11 (17%)	79,96,96	1.40	10 (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	A1IFK	K	302	11	-	10/49/99/99	0/4/5/5
16	MES	V	301	-	-	1/6/14/14	0/1/1/1
16	MES	H	301	-	-	2/6/14/14	0/1/1/1
17	A1IFK	H	303	8	-	2/49/99/99	0/4/5/5
16	MES	J	201	-	-	5/6/14/14	0/1/1/1
17	A1IFK	V	302	8	-	3/49/99/99	0/4/5/5
16	MES	X	201	-	-	1/6/14/14	0/1/1/1
16	MES	b	201	-	-	0/6/14/14	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
17	A1IFK	Y	302	11	-	9/49/99/99	0/4/5/5

The worst 5 of 41 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
17	Y	302	A1IFK	CB2-CA2	7.68	1.65	1.53
17	H	303	A1IFK	CB1-CG	-6.93	1.35	1.51
17	K	302	A1IFK	CB1-CG	-6.90	1.35	1.51
17	Y	302	A1IFK	CB1-CG	-6.80	1.35	1.51
17	K	302	A1IFK	O58-C11	-6.20	1.36	1.44

The worst 5 of 44 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
17	H	303	A1IFK	O20-C18-N17	5.62	119.30	110.78
17	Y	302	A1IFK	O20-C18-N17	5.06	118.45	110.78
17	V	302	A1IFK	O20-C18-N17	5.03	118.41	110.78
17	K	302	A1IFK	O20-C18-N17	4.94	118.28	110.78
17	Y	302	A1IFK	C25-N17-C16	4.57	122.00	112.68

There are no chirality outliers.

5 of 33 torsion outliers are listed below:

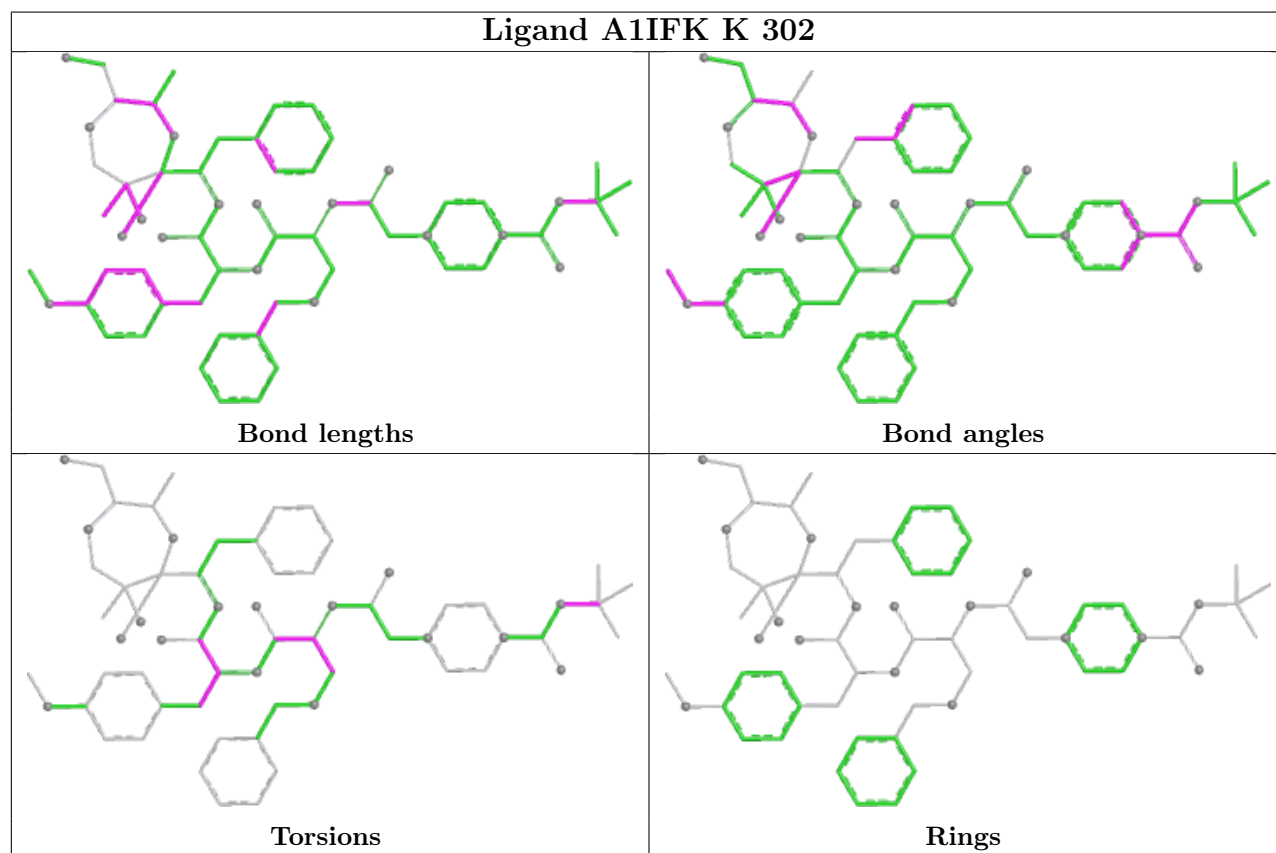
Mol	Chain	Res	Type	Atoms
16	J	201	MES	C8-C7-N4-C3
16	J	201	MES	C7-C8-S-O2S
16	J	201	MES	C7-C8-S-O3S
17	Y	302	A1IFK	CA-CB-OG-C'
17	K	302	A1IFK	C24-C21-O20-C18

There are no ring outliers.

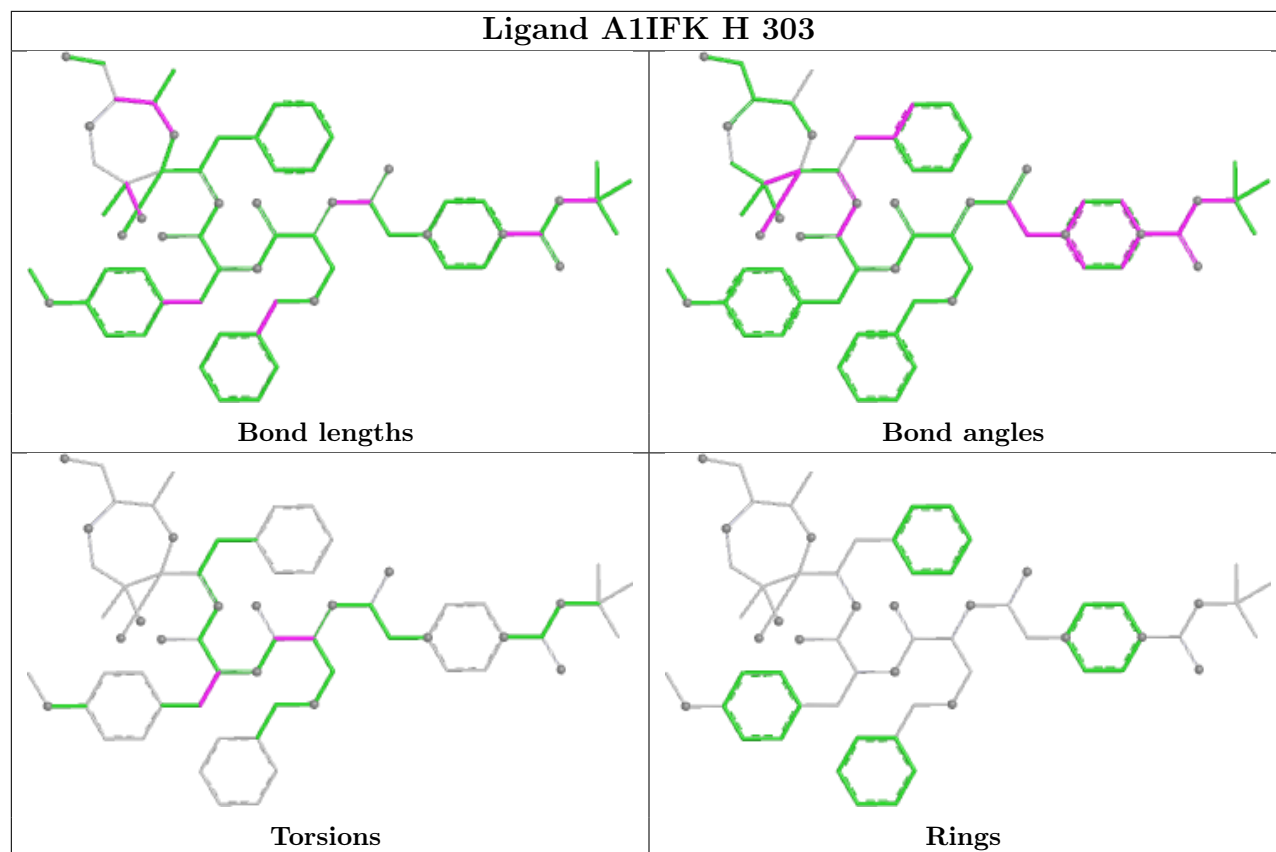
6 monomers are involved in 30 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
17	K	302	A1IFK	2	0
17	H	303	A1IFK	6	0
17	V	302	A1IFK	5	0
16	X	201	MES	1	0
16	b	201	MES	12	0
17	Y	302	A1IFK	4	0

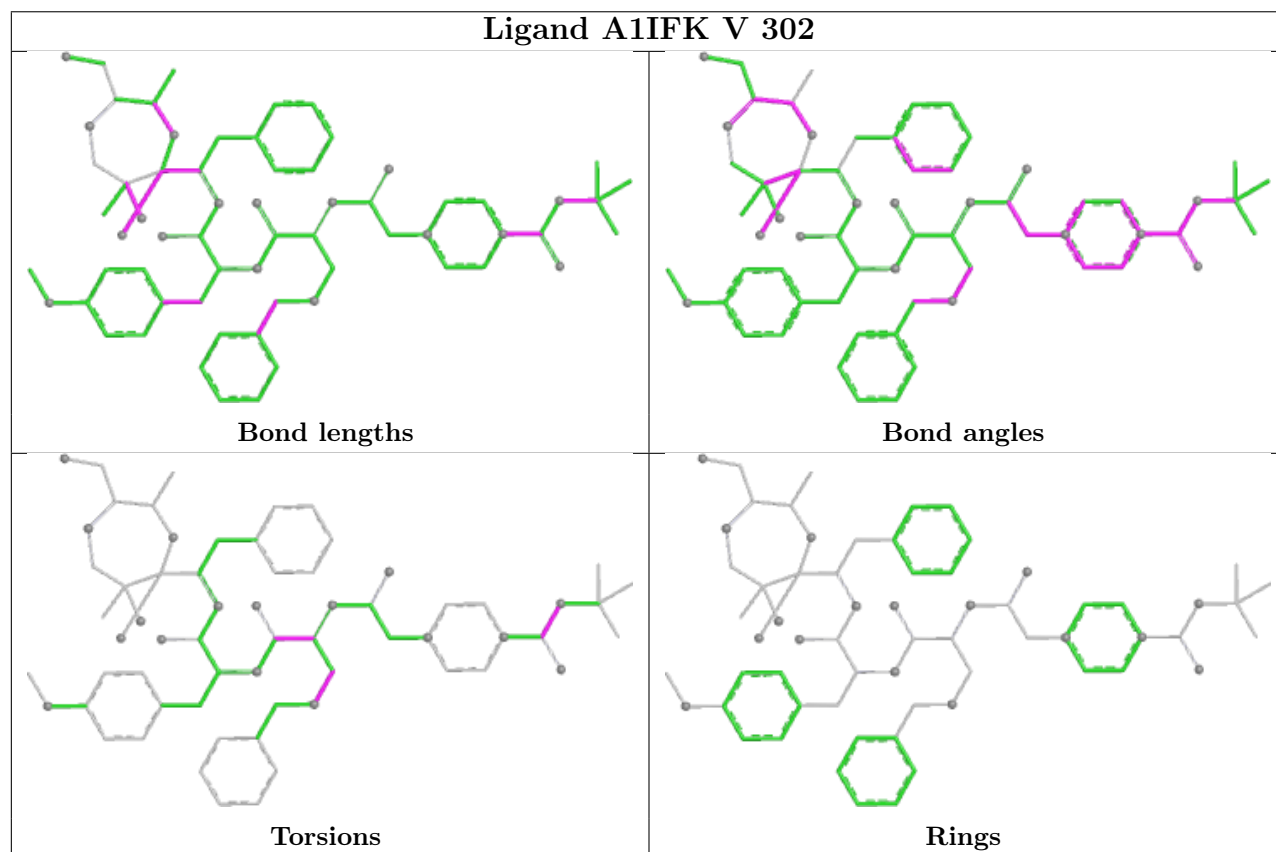
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

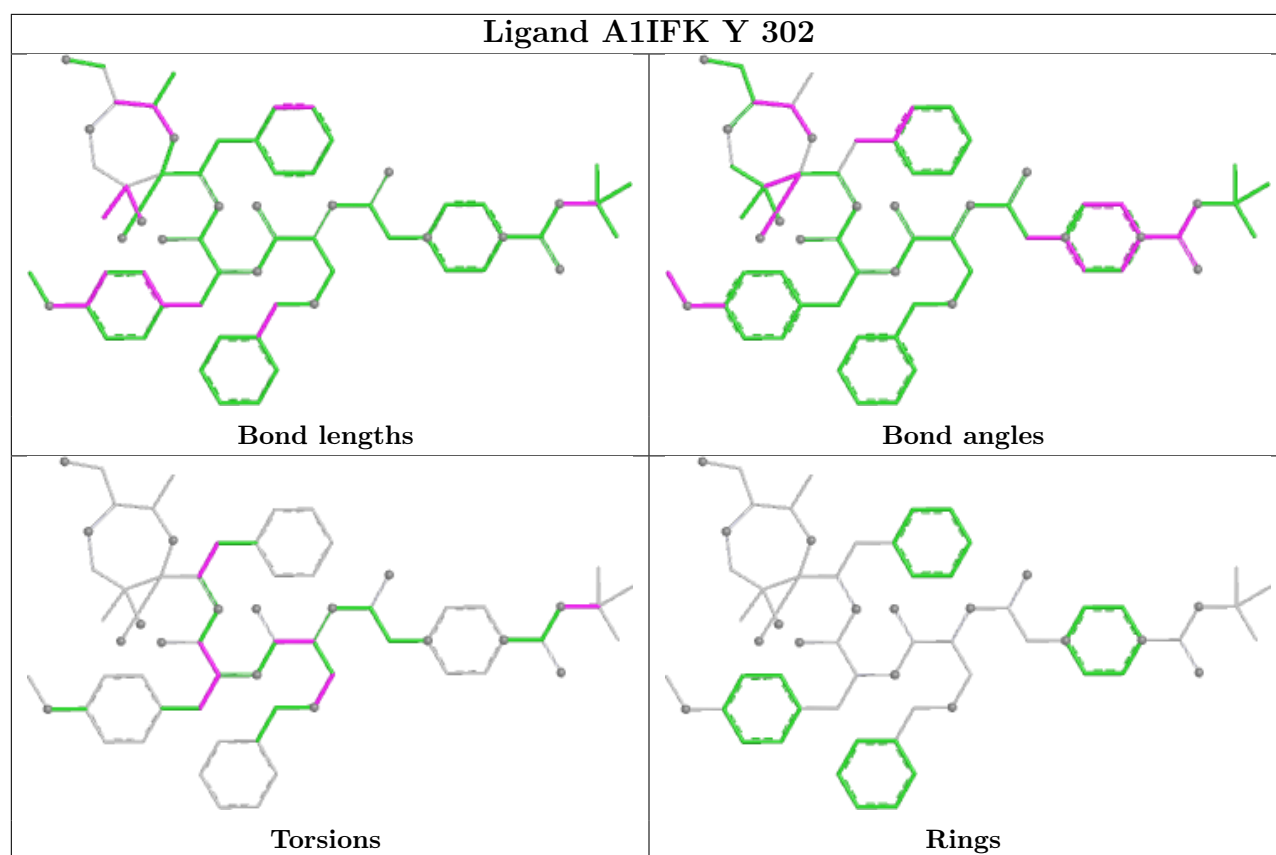


## Ligand A1IFK H 303



## Ligand A1IFK V 302





## 5.7 Other polymers [i](#)

There are no such residues in this entry.

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

There are no chain breaks in this entry.

## 6 Fit of model and data ⓘ

### 6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	250/250 (100%)	-0.47	2 (0%) 82 80	45, 60, 95, 136	0
1	O	250/250 (100%)	-0.46	1 (0%) 88 86	49, 67, 104, 131	0
2	B	244/258 (94%)	-0.24	5 (2%) 65 60	43, 64, 121, 166	0
2	P	244/258 (94%)	-0.16	7 (2%) 53 48	48, 67, 122, 153	0
3	C	240/254 (94%)	-0.29	2 (0%) 82 80	44, 66, 126, 155	0
3	Q	240/254 (94%)	-0.17	4 (1%) 69 64	53, 80, 142, 171	0
4	D	235/260 (90%)	-0.41	2 (0%) 81 78	47, 69, 101, 134	0
4	R	235/260 (90%)	-0.30	2 (0%) 81 78	51, 72, 109, 134	0
5	E	231/234 (98%)	-0.34	1 (0%) 88 86	50, 71, 103, 129	0
5	S	231/234 (98%)	-0.27	2 (0%) 81 78	49, 77, 113, 132	0
6	F	243/288 (84%)	-0.41	1 (0%) 88 86	42, 65, 106, 135	0
6	T	243/288 (84%)	-0.32	2 (0%) 82 80	47, 71, 113, 136	0
7	G	241/252 (95%)	-0.41	2 (0%) 82 80	43, 62, 98, 133	0
7	U	241/252 (95%)	-0.45	1 (0%) 88 86	46, 63, 97, 118	0
8	H	221/231 (95%)	-0.46	1 (0%) 87 85	44, 58, 84, 135	0
8	V	221/231 (95%)	-0.44	0 100 100	44, 63, 84, 130	0
9	I	204/205 (99%)	-0.60	0 100 100	41, 55, 82, 111	0
9	W	204/205 (99%)	-0.62	0 100 100	40, 57, 82, 112	0
10	J	195/198 (98%)	-0.55	1 (0%) 87 85	38, 55, 82, 118	0
10	X	195/198 (98%)	-0.59	1 (0%) 87 85	43, 58, 80, 130	0
11	K	211/211 (100%)	-0.60	1 (0%) 87 85	42, 55, 76, 101	0
11	Y	211/211 (100%)	-0.55	0 100 100	45, 57, 81, 102	0
12	L	222/222 (100%)	-0.62	0 100 100	39, 58, 81, 91	0
12	Z	222/222 (100%)	-0.50	1 (0%) 87 85	41, 59, 87, 105	0

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
13	M	233/246 (94%)	-0.54	2 (0%) 81 78	41, 58, 84, 121	0
13	a	233/246 (94%)	-0.55	3 (1%) 75 71	43, 58, 80, 127	0
14	N	196/196 (100%)	-0.65	0 100 100	40, 54, 80, 111	0
14	b	196/196 (100%)	-0.57	0 100 100	41, 54, 84, 104	0
All	All	6332/6610 (95%)	-0.44	44 (0%) 84 82	38, 62, 104, 171	0

The worst 5 of 44 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	P	51	VAL	4.3
3	Q	50	LEU	4.0
2	B	51	VAL	4.0
13	a	233	ILE	4.0
2	B	50	LYS	3.3

## 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, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
16	MES	b	201	12/12	0.75	0.48	20,20,20,20	0
15	MG	H	302	1/1	0.87	0.15	101,101,101,101	0
17	A1IFK	V	302	64/64	0.92	0.11	36,52,67,98	0
17	A1IFK	K	302	64/64	0.93	0.11	30,44,54,70	0
17	A1IFK	Y	302	64/64	0.93	0.11	29,46,55,68	0
16	MES	V	301	12/12	0.94	0.15	94,101,107,108	0
16	MES	H	301	12/12	0.94	0.13	79,95,98,99	0

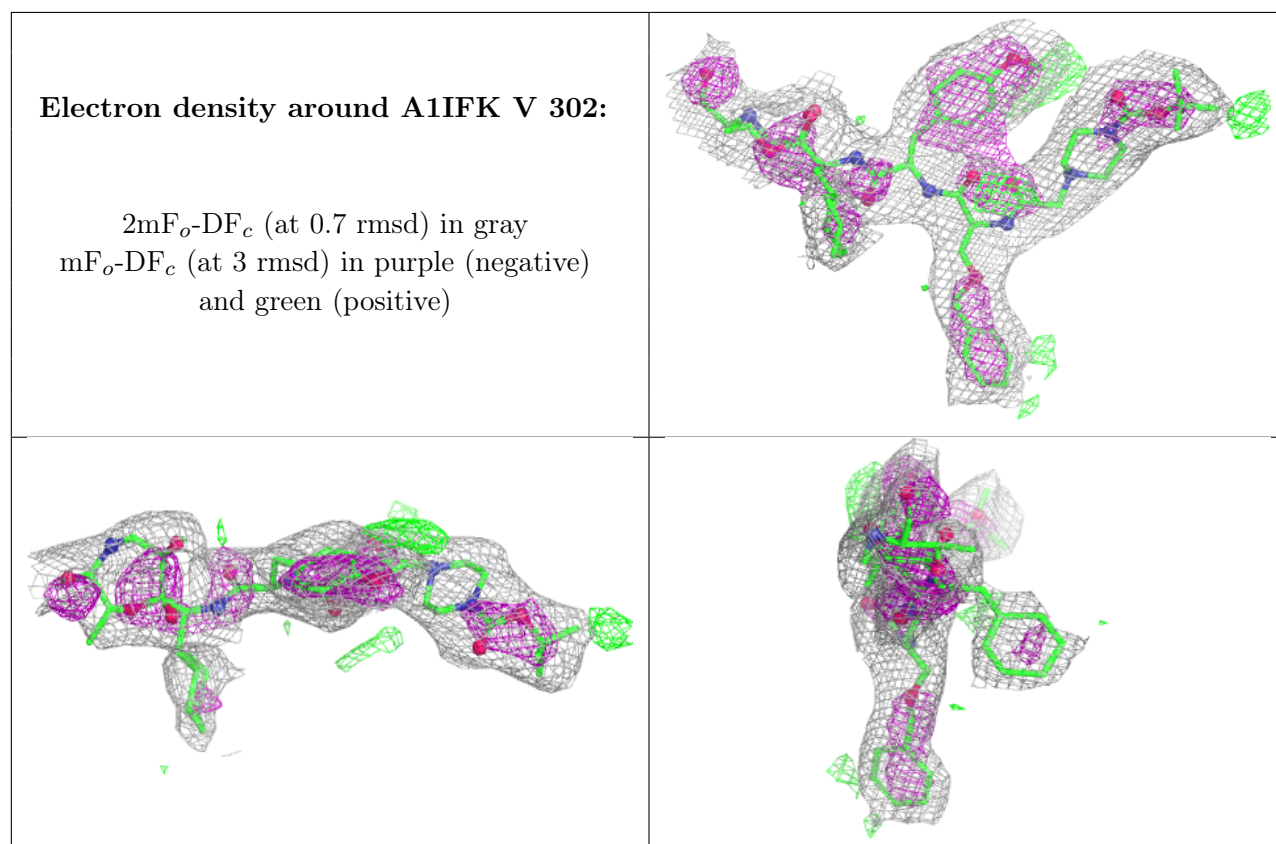
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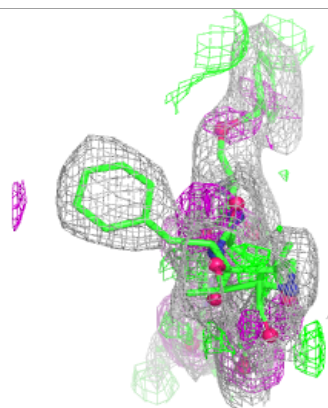
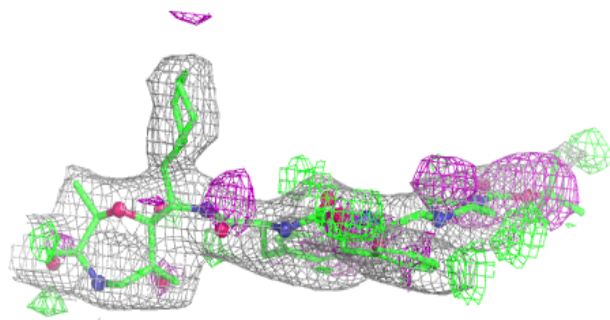
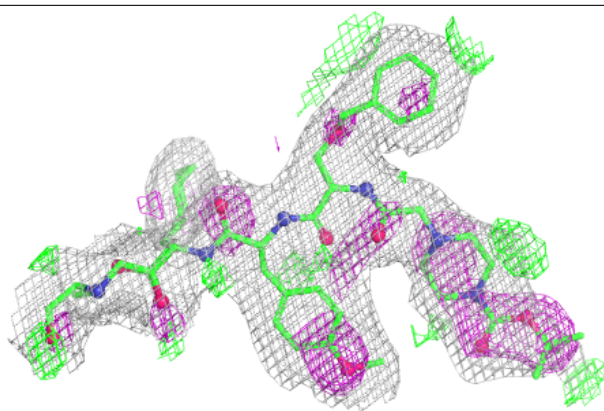
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
17	A1IFK	H	303	64/64	0.94	0.11	34,51,66,148	0
15	MG	I	301	1/1	0.95	0.18	149,149,149,149	0
15	MG	Z	301	1/1	0.96	0.14	127,127,127,127	0
16	MES	X	201	12/12	0.97	0.09	79,81,88,88	0
16	MES	J	201	12/12	0.97	0.10	66,82,89,89	0
15	MG	G	301	1/1	0.98	0.06	81,81,81,81	0
15	MG	Y	301	1/1	0.98	0.09	93,93,93,93	0
15	MG	N	201	1/1	0.99	0.07	74,74,74,74	0
15	MG	K	301	1/1	0.99	0.06	85,85,85,85	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.

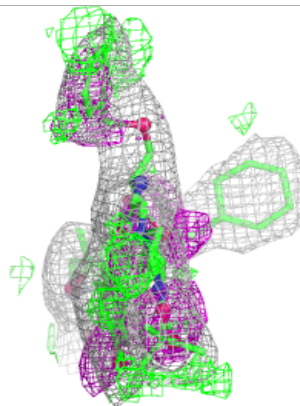
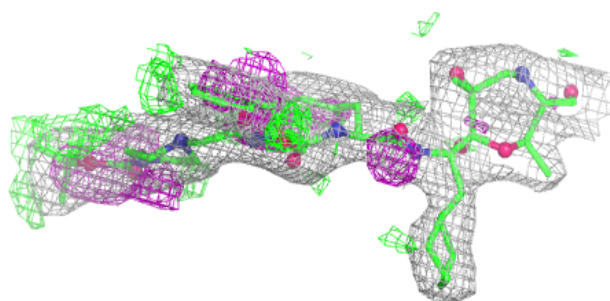
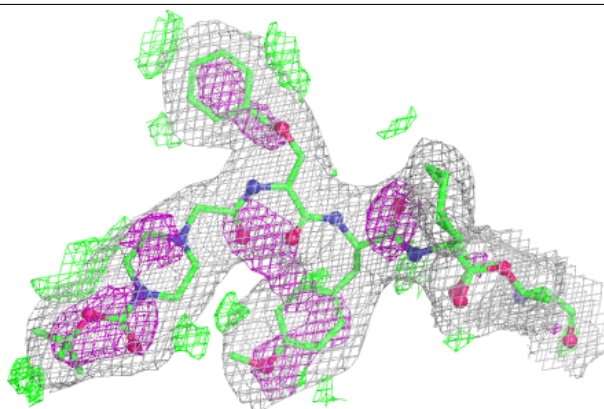


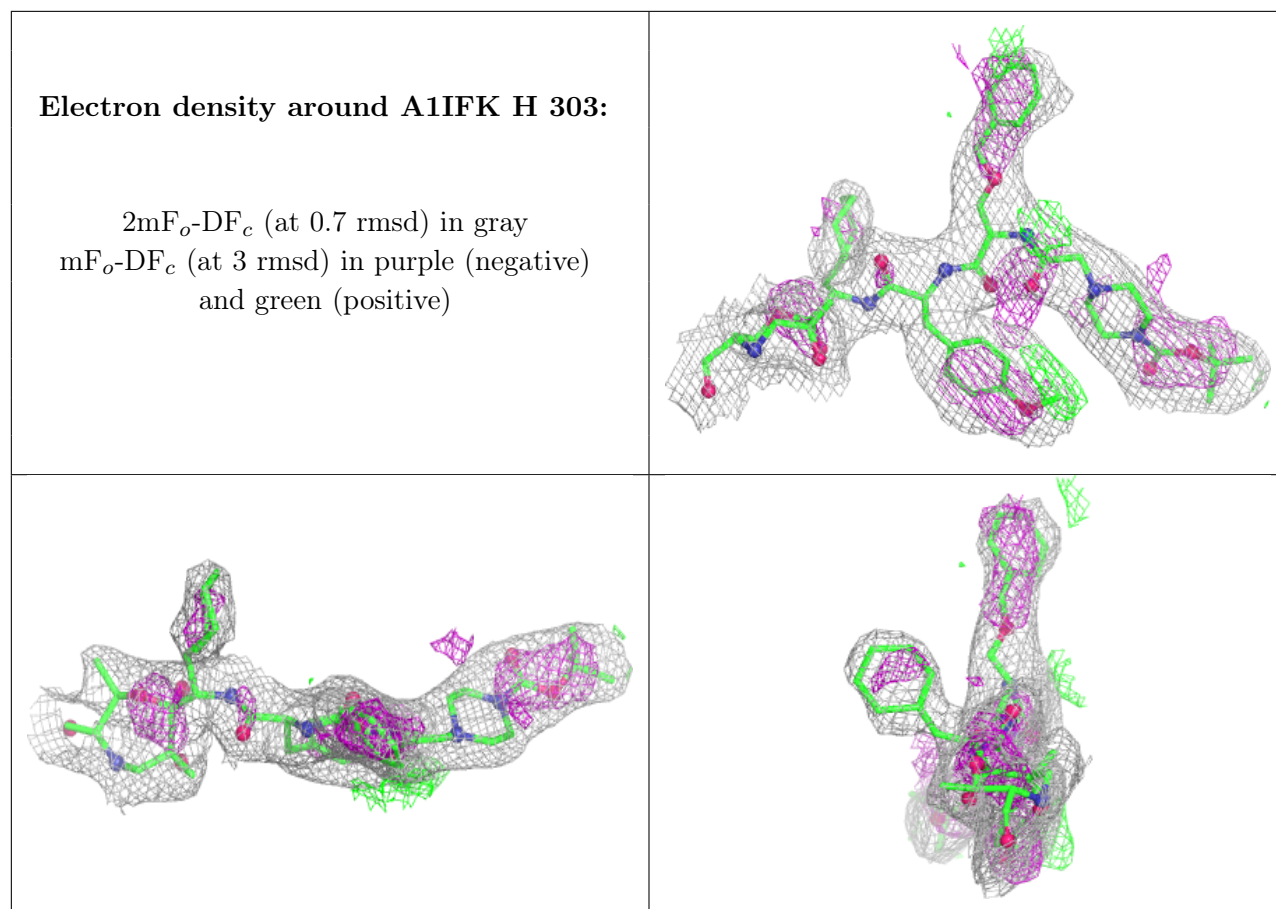
**Electron density around A1IFK K 302:**

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

**Electron density around A1IFK 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)





## 6.5 Other polymers ⓘ

There are no such residues in this entry.