



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 11:27 AM UTC

PDB ID : 4E7C / pdb\_00004e7c  
Title : E. cloacae MurA in complex with UTP  
Authors : Zhu, J.-Y.; Yang, Y.; Schonbrunn, E.  
Deposited on : 2012-03-16  
Resolution : 2.10 Å(reported)

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

We welcome your comments at [validation@mail.wwpdb.org](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

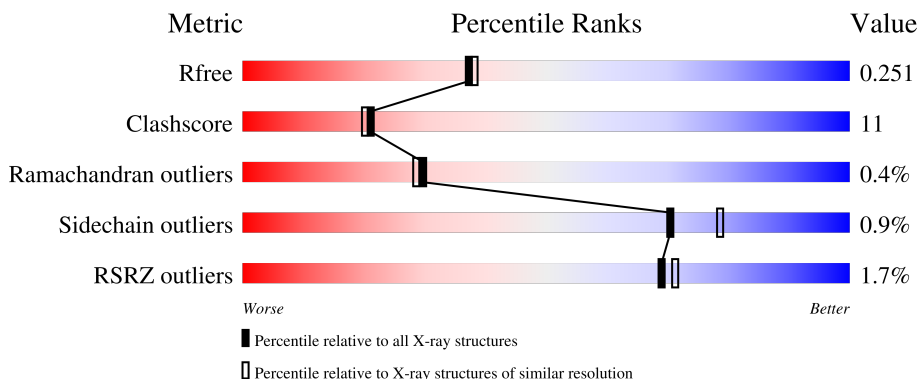
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.10 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	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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	419	<div> <div>%</div> <div> <div></div> <div>77%</div> <div>22%</div> <div>.</div> </div> </div>
1	B	419	<div> <div>3%</div> <div> <div></div> <div>76%</div> <div>21%</div> <div>.</div> </div> </div>
1	C	419	<div> <div>%</div> <div> <div></div> <div>79%</div> <div>19%</div> <div>.</div> </div> </div>
1	D	419	<div> <div>2%</div> <div> <div></div> <div>73%</div> <div>24%</div> <div>.</div> </div> </div>

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 13738 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 UDP-N-acetylglucosamine 1-carboxyvinyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	419	Total	C	N	O	S	0	1	0
			3145	1977	554	600	14			
1	B	419	Total	C	N	O	S	0	0	0
			3143	1976	554	599	14			
1	C	419	Total	C	N	O	S	0	1	0
			3148	1979	554	601	14			
1	D	419	Total	C	N	O	S	0	1	0
			3150	1980	557	599	14			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	67	IAS	ASN	SEE REMARK 999	UNP P33038
B	67	IAS	ASN	SEE REMARK 999	UNP P33038
C	67	IAS	ASN	SEE REMARK 999	UNP P33038
D	67	IAS	ASN	SEE REMARK 999	UNP P33038

- Molecule 2 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



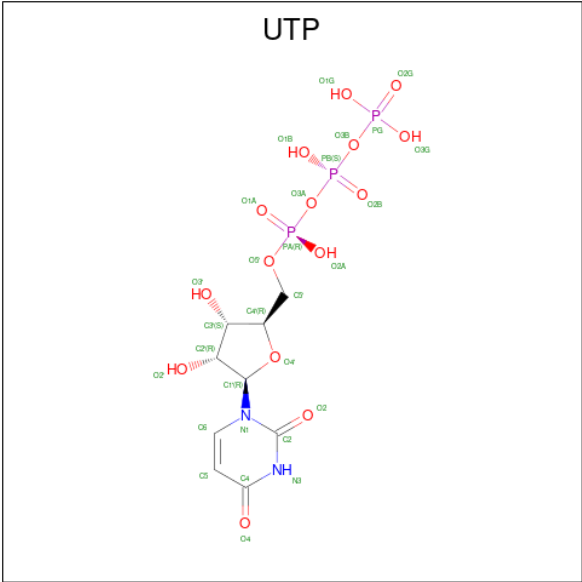
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			4	2	2		
2	A	1	Total	C	O	0	0
			4	2	2		
2	A	1	Total	C	O	0	0
			4	2	2		
2	B	1	Total	C	O	0	0
			4	2	2		
2	C	1	Total	C	O	0	0
			4	2	2		
2	C	1	Total	C	O	0	0
			4	2	2		
2	C	1	Total	C	O	0	0
			4	2	2		
2	C	1	Total	C	O	0	0
			4	2	2		
2	D	1	Total	C	O	0	0
			4	2	2		
2	D	1	Total	C	O	0	0
			4	2	2		
2	D	1	Total	C	O	0	0
			4	2	2		

- Molecule 3 is ACETATE ION (CCD ID: ACT) (formula: C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		
3	C	1	Total	C	O	0	0
			4	2	2		
3	D	1	Total	C	O	0	0
			4	2	2		
3	D	1	Total	C	O	0	0
			4	2	2		

- Molecule 4 is URIDINE 5'-TRIPHOSPHATE (CCD ID: UTP) (formula: C<sub>9</sub>H<sub>15</sub>N<sub>2</sub>O<sub>15</sub>P<sub>3</sub>).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
4	B	1	Total	C	N	O	P	0	0
			29	9	2	15	3		

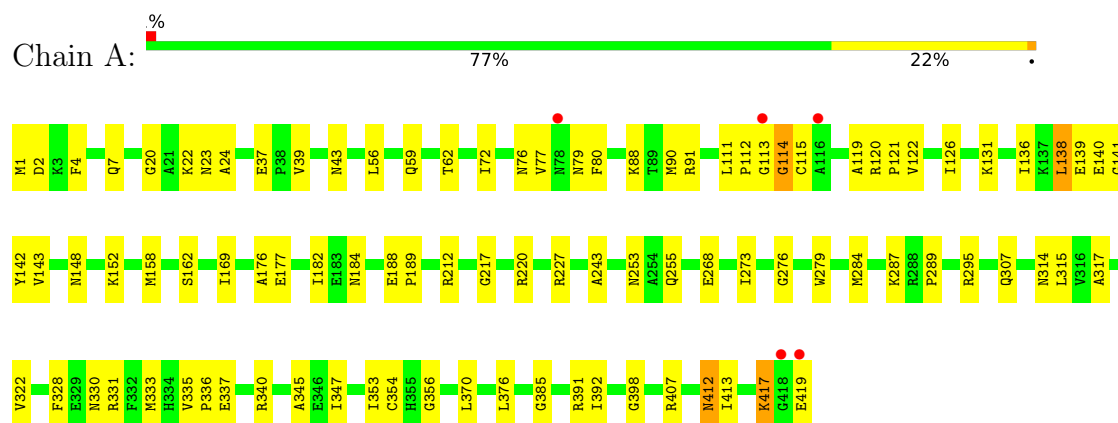
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	252	Total	O	0	0
			252	252		
5	B	259	Total	O	0	0
			259	259		
5	C	247	Total	O	0	0
			247	247		
5	D	264	Total	O	0	0
			264	264		

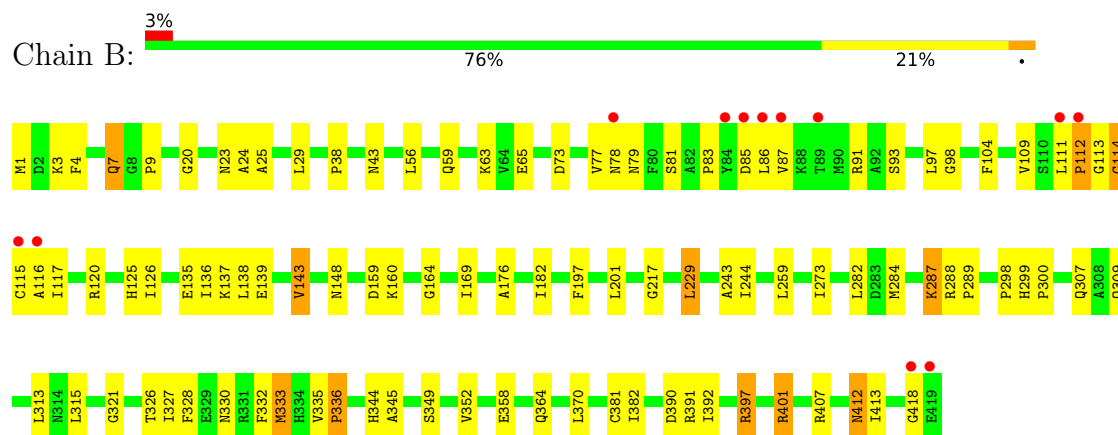
### 3 Residue-property plots [i](#)

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.

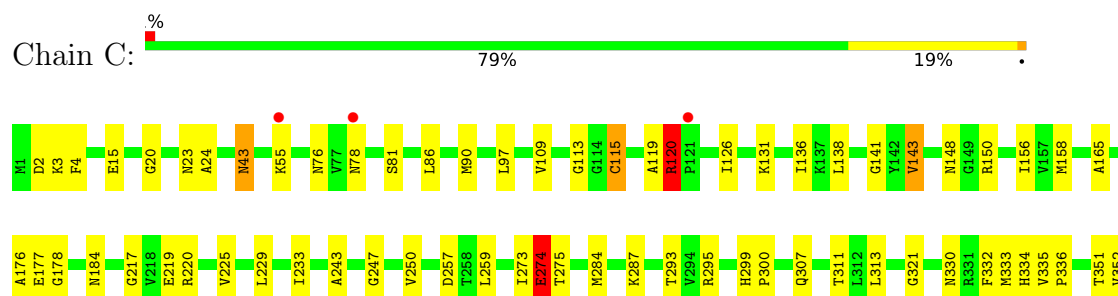
- Molecule 1: UDP-N-acetylglucosamine 1-carboxyvinyltransferase



- Molecule 1: UDP-N-acetylglucosamine 1-carboxyvinyltransferase

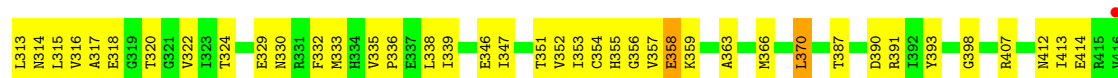
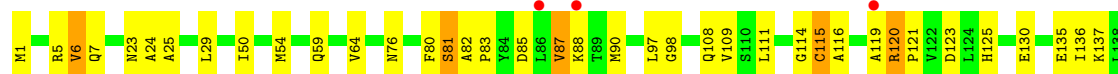
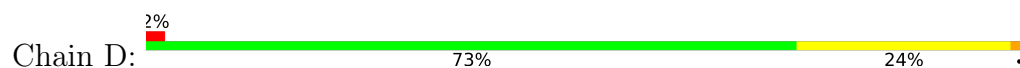


- Molecule 1: UDP-N-acetylglucosamine 1-carboxyvinyltransferase





● Molecule 1: UDP-N-acetylglucosamine 1-carboxyvinyltransferase





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	80.94Å 101.27Å 213.67Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.76 – 2.10 19.76 – 2.10	Depositor EDS
% Data completeness (in resolution range)	97.4 (19.76-2.10) 97.4 (19.76-2.10)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	0.07	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.55 (at 2.09Å)	Xtriage
Refinement program	CNS 1.3	Depositor
R, $R_{free}$	0.199 , 0.250 0.200 , 0.251	Depositor DCC
$R_{free}$ test set	1206 reflections (1.20%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	26.2	Xtriage
Anisotropy	0.039	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 43.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	13738	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.99% 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: IAS, UTP, ACT, EDO

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	0.71	9/3185 (0.3%)	1.22	19/4313 (0.4%)
1	B	0.60	7/3179 (0.2%)	1.19	15/4305 (0.3%)
1	C	0.66	9/3188 (0.3%)	1.20	18/4317 (0.4%)
1	D	0.65	8/3190 (0.3%)	1.19	22/4319 (0.5%)
All	All	0.66	33/12742 (0.3%)	1.20	74/17254 (0.4%)

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
1	C	0	4

All (33) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	112	PRO	N-CD	-14.63	1.27	1.47
1	C	274[A]	GLU	CA-CB	-6.70	1.38	1.53
1	C	274[B]	GLU	CA-CB	-6.70	1.38	1.53
1	A	122	VAL	CA-CB	-6.25	1.46	1.54
1	C	273	ILE	C-N	6.15	1.42	1.33
1	C	275	THR	N-CA	5.82	1.53	1.45
1	D	76	ASN	CG-OD1	5.67	1.34	1.23
1	B	23	ASN	CG-OD1	5.65	1.34	1.23
1	B	148	ASN	CG-OD1	5.62	1.34	1.23
1	C	184	ASN	CG-OD1	5.53	1.34	1.23
1	B	344	HIS	ND1-CE1	5.52	1.38	1.32
1	A	59	GLN	CD-OE1	5.52	1.34	1.23
1	C	43	ASN	CG-OD1	5.51	1.34	1.23
1	C	78	ASN	CG-OD1	5.45	1.33	1.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	148	ASN	CG-OD1	5.40	1.33	1.23
1	A	148	ASN	CG-OD1	5.34	1.33	1.23
1	D	7	GLN	CD-OE1	5.34	1.33	1.23
1	B	364	GLN	CD-OE1	5.34	1.33	1.23
1	D	59	GLN	CD-OE1	5.34	1.33	1.23
1	B	7	GLN	CD-OE1	5.33	1.33	1.23
1	D	412	ASN	CG-OD1	5.33	1.33	1.23
1	A	184	ASN	CG-OD1	5.30	1.33	1.23
1	D	23	ASN	CG-OD1	5.27	1.33	1.23
1	C	148	ASN	CG-OD1	5.21	1.33	1.23
1	D	314	ASN	CG-OD1	5.21	1.33	1.23
1	A	253	ASN	CG-OD1	5.19	1.33	1.23
1	A	23	ASN	CG-OD1	5.18	1.33	1.23
1	B	78	ASN	CG-OD1	5.17	1.33	1.23
1	A	79	ASN	CG-OD1	5.15	1.33	1.23
1	A	412	ASN	CG-OD1	5.13	1.33	1.23
1	C	23	ASN	CG-OD1	5.08	1.33	1.23
1	B	412	ASN	CG-OD1	5.08	1.33	1.23
1	D	330	ASN	CG-OD1	5.05	1.33	1.23

All (74) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	90	MET	N-CA-C	9.31	122.69	107.32
1	A	76	ASN	N-CA-C	9.04	121.29	110.44
1	D	151	LEU	N-CA-C	-8.72	99.28	110.53
1	A	114	GLY	N-CA-C	-8.67	92.62	113.18
1	D	115	CYS	N-CA-C	7.78	127.37	110.80
1	A	122	VAL	N-CA-CB	-7.72	98.49	111.23
1	A	112	PRO	CA-N-CD	7.69	122.77	112.00
1	D	81	SER	N-CA-C	7.27	120.75	108.90
1	A	88	LYS	N-CA-C	7.18	120.01	111.33
1	B	97	LEU	N-CA-C	7.09	118.70	110.97
1	D	97	LEU	N-CA-C	7.07	118.68	110.97
1	C	273	ILE	N-CA-C	6.71	117.56	108.17
1	C	257	ASP	N-CA-C	6.70	120.55	112.38
1	C	307	GLN	N-CA-C	6.70	118.58	111.28
1	A	24	ALA	N-CA-C	-6.62	105.20	113.55
1	A	273	ILE	N-CA-C	6.58	118.07	108.53
1	A	376	LEU	N-CA-C	6.55	118.42	111.28
1	A	138	LEU	N-CA-C	6.53	119.17	108.52
1	B	344	HIS	CB-CG-CD2	-6.53	122.72	131.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	115	CYS	N-CA-C	6.50	124.65	110.80
1	A	287	LYS	N-CA-C	6.43	120.54	110.32
1	D	156	ILE	N-CA-C	6.37	117.04	107.80
1	C	143	VAL	N-CA-C	-6.37	98.56	107.80
1	C	259	LEU	N-CA-C	6.32	120.63	112.41
1	C	97	LEU	N-CA-C	6.18	118.56	111.02
1	B	307	GLN	N-CA-C	6.14	118.51	111.02
1	A	80	PHE	N-CA-C	6.13	119.71	112.72
1	C	287	LYS	N-CA-C	6.10	120.21	109.96
1	A	90	MET	N-CA-C	6.01	119.04	107.44
1	C	81	SER	N-CA-C	5.94	118.79	108.76
1	D	273	ILE	N-CA-C	5.90	116.97	108.48
1	B	287	LYS	N-CA-C	5.72	119.42	110.32
1	A	122	VAL	CA-CB-CG1	5.67	120.03	110.40
1	B	143	VAL	N-CA-C	-5.65	97.74	107.24
1	D	257	ASP	N-CA-C	5.65	119.69	112.34
1	D	64	VAL	N-CA-C	5.64	116.87	108.46
1	B	370	LEU	N-CA-C	5.64	118.15	111.33
1	D	120	ARG	N-CA-C	5.63	119.43	109.58
1	B	24	ALA	N-CA-C	-5.58	106.52	113.55
1	D	24	ALA	N-CA-C	-5.50	106.62	113.55
1	D	418	GLY	N-CA-C	-5.49	108.30	114.40
1	B	81	SER	N-CA-C	5.49	117.85	108.90
1	C	120	ARG	N-CA-C	5.49	121.93	109.81
1	C	156	ILE	N-CA-C	5.48	115.84	108.17
1	B	344	HIS	CB-CG-ND1	5.46	130.90	122.70
1	B	333	MET	N-CA-C	5.44	118.71	111.75
1	B	273	ILE	N-CA-C	5.43	116.30	108.48
1	C	311	THR	N-CA-C	-5.42	105.45	111.36
1	B	229	LEU	N-CA-C	5.38	117.32	109.84
1	D	80	PHE	N-CA-C	5.35	118.82	112.72
1	A	162	SER	N-CA-C	5.33	117.11	108.26
1	A	23	ASN	N-CA-C	5.32	119.40	113.01
1	D	307	GLN	N-CA-C	5.31	117.50	111.02
1	D	287	LYS	N-CA-C	5.30	118.58	110.20
1	A	122	VAL	CA-CB-CG2	5.30	119.41	110.40
1	C	417	LYS	N-CA-C	5.24	117.64	108.52
1	D	259	LEU	N-CA-C	5.21	118.95	112.59
1	D	358	GLU	N-CA-C	5.20	117.03	111.36
1	C	359	LYS	N-CA-C	5.17	117.85	109.06
1	D	82	ALA	CA-C-N	5.16	125.06	119.85
1	D	82	ALA	C-N-CA	5.16	125.06	119.85

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	141	GLY	N-CA-C	-5.14	108.16	115.30
1	C	247	GLY	N-CA-C	5.14	119.61	112.57
1	A	255	GLN	CA-C-N	5.12	126.24	119.84
1	A	255	GLN	C-N-CA	5.12	126.24	119.84
1	D	333	MET	N-CA-C	5.11	118.30	111.75
1	B	358	GLU	N-CA-C	5.11	116.85	111.28
1	D	303	PRO	N-CA-C	5.09	118.48	110.80
1	D	6	VAL	N-CA-C	5.08	115.44	108.12
1	A	122	VAL	CB-CA-C	5.05	119.58	111.29
1	D	90	MET	N-CA-C	5.04	117.17	107.44
1	C	24	ALA	N-CA-C	-5.04	107.20	113.55
1	B	328	PHE	N-CA-C	5.03	118.15	110.20
1	B	259	LEU	N-CA-C	5.00	118.92	112.41

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	274[A]	GLU	Sidechain,Mainchain
1	C	274[B]	GLU	Sidechain,Mainchain

## 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	3145	0	3217	76	0
1	B	3143	0	3216	81	0
1	C	3148	0	3218	66	0
1	D	3150	0	3225	77	0
2	A	12	0	18	1	0
2	B	4	0	6	0	0
2	C	20	0	30	9	0
2	D	12	0	18	2	0
3	A	8	0	6	0	0
3	B	4	0	3	1	0
3	C	4	0	3	0	0
3	D	8	0	6	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	29	0	11	0	0
4	B	29	0	11	0	0
5	A	252	0	0	6	0
5	B	259	0	0	12	0
5	C	247	0	0	8	0
5	D	264	0	0	8	0
All	All	13738	0	12988	282	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 11.

All (282) 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)
1:C:55:LYS:CE	1:C:86:LEU:HD21	1.78	1.13
1:C:55:LYS:HE3	1:C:86:LEU:HD21	1.31	1.10
1:C:55:LYS:HD3	1:C:86:LEU:CD2	1.87	1.03
1:C:55:LYS:CD	1:C:86:LEU:HD21	1.94	0.97
1:C:55:LYS:CD	1:C:86:LEU:CD2	2.46	0.94
1:B:137:LYS:HE2	1:D:137:LYS:HD3	1.51	0.91
1:C:15:GLU:HG2	1:C:250:VAL:HB	1.53	0.91
1:C:178:GLY:H	2:C:505:EDO:H11	1.35	0.89
1:D:150[B]:ARG:NH1	1:D:219:GLU:HA	1.92	0.83
1:C:397:ARG:HH21	2:C:501:EDO:H11	1.44	0.82
1:B:85:ASP:HB2	5:B:728:HOH:O	1.80	0.81
1:B:137:LYS:HG2	1:D:137:LYS:HG2	1.63	0.81
1:A:62:THR:HG22	1:A:77:VAL:HG22	1.63	0.80
1:D:121:PRO:HD2	5:D:656:HOH:O	1.81	0.79
1:B:309:GLN:HG2	5:B:812:HOH:O	1.81	0.79
1:B:407:ARG:HD3	5:B:813:HOH:O	1.85	0.76
1:A:1:MET:HE3	1:A:391:ARG:NH1	2.00	0.76
1:B:135:GLU:HG3	1:D:139:GLU:HB3	1.67	0.76
1:D:88:LYS:HD2	5:D:745:HOH:O	1.84	0.76
1:C:55:LYS:CE	1:C:86:LEU:CD2	2.64	0.75
1:A:158:MET:HE2	1:A:182:ILE:CG2	2.19	0.72
1:C:55:LYS:HD3	1:C:86:LEU:HD22	1.74	0.70
1:A:120:ARG:HA	1:A:120:ARG:NE	2.05	0.69
1:B:326:THR:OG1	1:B:327:ILE:HD12	1.92	0.69
1:B:336:PRO:HG2	1:C:333:MET:HE2	1.75	0.69
1:B:298:PRO:HD3	1:B:327:ILE:HD11	1.75	0.69
1:A:417:LYS:H	1:A:417:LYS:CE	2.06	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:115:CYS:HB3	1:C:131:LYS:HD2	1.74	0.68
1:D:150[B]:ARG:HH12	1:D:219:GLU:HA	1.56	0.67
1:D:358:GLU:HG3	1:D:359:LYS:HG3	1.77	0.67
1:D:335:VAL:HB	1:D:336:PRO:HD3	1.78	0.65
1:A:268:GLU:OE2	3:B:502:ACT:H1	1.96	0.65
1:C:335:VAL:HB	1:C:336:PRO:HD3	1.79	0.65
1:D:407:ARG:HD3	5:D:635:HOH:O	1.95	0.65
1:B:1:MET:HE3	1:B:391:ARG:NH2	2.11	0.64
1:A:295:ARG:NH2	5:A:705:HOH:O	2.30	0.64
1:A:113:GLY:C	1:A:115:CYS:N	2.52	0.64
1:B:83:PRO:HD2	1:B:86:LEU:HD12	1.79	0.63
1:B:79:ASN:ND2	5:B:727:HOH:O	2.17	0.62
1:D:413:ILE:HD12	1:D:414:GLU:H	1.65	0.62
1:C:397:ARG:NH2	2:C:501:EDO:H11	2.14	0.61
1:C:109:VAL:O	1:C:143:VAL:HG12	1.99	0.61
1:A:113:GLY:C	1:A:115:CYS:H	2.06	0.61
1:B:114:GLY:C	1:B:116:ALA:H	2.09	0.61
1:A:335:VAL:HB	1:A:347:ILE:HD11	1.83	0.61
1:A:417:LYS:H	1:A:417:LYS:HE3	1.65	0.61
1:B:63:LYS:HB2	1:B:73:ASP:HB3	1.82	0.60
1:C:126:ILE:HG23	1:C:136:ILE:HG21	1.83	0.60
1:A:115:CYS:HB3	1:C:131:LYS:CD	2.30	0.60
1:A:115:CYS:HB2	1:A:140:GLU:OE2	2.02	0.60
1:B:176:ALA:O	1:B:217:GLY:HA3	2.03	0.59
1:B:336:PRO:HG2	1:C:333:MET:CE	2.32	0.59
1:C:177:GLU:HG3	2:C:505:EDO:O2	2.02	0.59
1:B:56:LEU:HD23	1:B:56:LEU:C	2.29	0.58
1:D:282:LEU:HD23	1:D:282:LEU:C	2.28	0.58
1:D:370:LEU:CD1	1:D:398:GLY:HA3	2.34	0.58
1:A:417:LYS:CE	1:A:417:LYS:N	2.67	0.58
1:B:335:VAL:HB	1:B:336:PRO:HD3	1.86	0.58
1:A:2:ASP:HB3	1:A:392:ILE:HD11	1.86	0.58
1:A:276:GLY:HA3	1:A:279:TRP:NE1	2.19	0.57
1:B:143:VAL:HG13	1:B:143:VAL:O	2.05	0.57
1:A:227:ARG:HE	2:A:503:EDO:C2	2.17	0.57
1:B:65:GLU:HG2	5:B:851:HOH:O	2.05	0.57
1:B:330:ASN:OD1	1:B:333:MET:HE2	2.05	0.56
1:A:114:GLY:O	1:A:119:ALA:HB3	2.05	0.56
1:B:4:PHE:CD2	1:B:392:ILE:HG21	2.40	0.56
1:C:274[B]:GLU:HG3	5:C:762:HOH:O	2.05	0.56
1:B:38:PRO:HG3	1:B:73:ASP:OD2	2.06	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:417:LYS:N	1:A:417:LYS:HE2	2.21	0.55
1:D:135:GLU:OE2	1:D:137:LYS:HE2	2.07	0.55
1:B:113:GLY:O	1:B:114:GLY:O	2.25	0.55
1:A:4:PHE:CD2	1:A:392:ILE:HG21	2.41	0.55
1:D:324:THR:HG23	1:D:351:THR:HG22	1.89	0.55
1:D:220:ARG:HG3	1:D:220:ARG:HH11	1.72	0.55
1:B:313:LEU:HD23	1:B:313:LEU:C	2.31	0.54
1:B:391:ARG:HD3	5:B:827:HOH:O	2.05	0.54
1:A:333:MET:O	1:A:336:PRO:HD2	2.06	0.54
1:C:3:LYS:HB2	1:C:416:VAL:CG1	2.38	0.54
1:D:85:ASP:HA	1:D:88:LYS:HE2	1.88	0.54
1:D:322:VAL:HG13	1:D:353:ILE:HD13	1.89	0.54
1:C:299:HIS:CG	1:C:300:PRO:HA	2.42	0.54
1:A:330:ASN:HB2	2:D:502:EDO:O2	2.08	0.54
1:C:176:ALA:O	1:C:217:GLY:HA3	2.08	0.54
1:B:332:PHE:CD1	1:B:352:VAL:HG21	2.44	0.53
1:A:1:MET:HE3	1:A:391:ARG:HH12	1.74	0.53
1:B:109:VAL:O	1:B:143:VAL:HG12	2.07	0.53
1:B:397:ARG:HD3	5:B:695:HOH:O	2.08	0.53
1:B:135:GLU:OE2	1:B:137:LYS:HE3	2.09	0.53
1:C:407:ARG:HD3	5:C:657:HOH:O	2.09	0.53
1:A:417:LYS:H	1:A:417:LYS:HE2	1.73	0.53
1:B:244:ILE:HD12	1:B:382:ILE:HD13	1.89	0.53
1:A:317:ALA:O	1:A:356:GLY:HA3	2.09	0.52
1:C:293:THR:OG1	2:C:503:EDO:H11	2.08	0.52
1:D:186:ALA:HB3	1:D:191:ILE:CD1	2.39	0.52
1:A:91:ARG:HG3	1:A:91:ARG:HH11	1.75	0.52
1:D:120:ARG:HB2	1:D:123:ASP:OD2	2.09	0.52
1:A:176:ALA:O	1:A:217:GLY:HA3	2.09	0.52
1:A:56:LEU:O	1:A:56:LEU:HD23	2.10	0.51
1:A:370:LEU:CD1	1:A:398:GLY:HA3	2.40	0.51
1:C:3:LYS:HB2	1:C:416:VAL:HG13	1.93	0.51
1:A:314:ASN:HB3	1:A:354:CYS:HB2	1.91	0.51
1:D:289:PRO:HG2	1:D:317:ALA:HA	1.92	0.51
1:C:295:ARG:HE	1:D:184:ASN:HD21	1.56	0.51
1:A:330:ASN:OD1	1:A:333:MET:HE2	2.11	0.50
1:D:125:HIS:CE1	1:D:164:GLY:C	2.89	0.50
1:A:111:LEU:O	1:A:141:GLY:HA2	2.11	0.50
1:D:391:ARG:HD2	1:D:393:TYR:HE2	1.75	0.50
1:C:313:LEU:C	1:C:313:LEU:HD23	2.37	0.50
1:C:401:ARG:HD2	5:C:845:HOH:O	2.11	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:402:ILE:HG23	1:C:403:GLU:N	2.25	0.50
1:D:158:MET:HE1	1:D:165:ALA:HB3	1.93	0.50
1:B:126:ILE:HG23	1:B:136:ILE:HG21	1.93	0.49
1:C:3:LYS:HE2	1:C:419:GLU:HG2	1.93	0.49
1:C:332:PHE:CZ	1:C:352:VAL:HG23	2.48	0.49
1:B:20:GLY:HA3	1:B:43:ASN:O	2.13	0.49
1:D:315:LEU:HD23	1:D:354:CYS:HB3	1.94	0.49
1:C:143:VAL:O	1:C:143:VAL:HG13	2.13	0.49
1:D:318:GLU:HB3	5:D:853:HOH:O	2.12	0.49
1:A:91:ARG:NH2	1:A:121:PRO:O	2.44	0.48
1:A:315:LEU:HD23	1:A:354:CYS:HB3	1.95	0.48
1:A:212:ARG:NH2	1:B:321:GLY:HA2	2.27	0.48
1:B:115:CYS:SG	1:D:130:GLU:HG2	2.53	0.48
1:B:137:LYS:HG2	1:D:137:LYS:CG	2.40	0.48
1:D:114:GLY:O	1:D:116:ALA:N	2.46	0.48
1:A:56:LEU:HD23	1:A:56:LEU:C	2.38	0.48
1:C:4:PHE:CD2	1:C:392:ILE:HG21	2.48	0.48
1:B:332:PHE:CD1	1:B:352:VAL:CG2	2.97	0.48
1:A:62:THR:CG2	1:A:77:VAL:HG22	2.41	0.48
1:A:276:GLY:HA3	1:A:279:TRP:CE2	2.48	0.48
1:B:87:VAL:CG1	5:B:830:HOH:O	2.62	0.48
1:B:298:PRO:HD3	1:B:327:ILE:CD1	2.42	0.48
1:A:7:GLN:HE22	1:A:385:GLY:HA2	1.78	0.48
1:B:59:GLN:CG	1:B:86:LEU:HD11	2.44	0.48
1:D:313:LEU:C	1:D:313:LEU:HD23	2.39	0.48
1:B:3:LYS:HG2	1:B:390:ASP:OD2	2.13	0.47
1:B:56:LEU:HD23	1:B:56:LEU:O	2.14	0.47
1:C:243:ALA:HA	1:C:284:MET:CG	2.45	0.47
1:B:160:LYS:HD3	5:B:762:HOH:O	2.13	0.47
1:D:1:MET:HE3	1:D:391:ARG:HD3	1.96	0.47
1:D:335:VAL:O	1:D:339:ILE:HG12	2.15	0.47
1:A:331:ARG:HB3	1:A:331:ARG:NH2	2.30	0.47
1:B:349:SER:O	1:C:330:ASN:ND2	2.44	0.47
1:C:178:GLY:N	2:C:505:EDO:H11	2.15	0.47
1:C:220:ARG:HG3	1:C:220:ARG:HH11	1.79	0.47
1:D:176:ALA:O	1:D:217:GLY:HA3	2.15	0.47
1:D:366:MET:HE2	1:D:391:ARG:NH2	2.30	0.47
1:B:243:ALA:HA	1:B:284:MET:CG	2.44	0.47
1:D:317:ALA:O	1:D:356:GLY:HA3	2.15	0.47
1:C:2:ASP:OD2	1:C:415:ARG:HD3	2.14	0.47
1:D:320:THR:HA	1:D:354:CYS:O	2.15	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:7:GLN:HB3	1:B:412:ASN:CG	2.40	0.47
1:D:366:MET:HB2	1:D:390:ASP:HB3	1.96	0.47
1:B:59:GLN:CB	1:B:86:LEU:HD11	2.45	0.46
1:D:150[B]:ARG:HH12	1:D:219:GLU:CA	2.26	0.46
1:A:322:VAL:HG13	1:A:353:ILE:HD13	1.97	0.46
1:A:158:MET:CE	5:A:601:HOH:O	2.62	0.46
1:C:158:MET:HE1	1:C:165:ALA:HB3	1.97	0.46
1:A:139:GLU:HB2	1:A:142:TYR:CE2	2.50	0.46
1:B:315:LEU:HD21	1:B:345:ALA:HB2	1.97	0.46
1:D:299:HIS:CG	1:D:300:PRO:HA	2.50	0.46
1:D:332:PHE:CZ	1:D:352:VAL:HG23	2.50	0.46
1:A:333:MET:HE1	1:D:347:ILE:CD1	2.45	0.46
1:C:366:MET:SD	1:C:366:MET:C	2.99	0.46
1:D:120:ARG:HD3	5:D:738:HOH:O	2.15	0.46
1:B:114:GLY:C	1:B:116:ALA:N	2.74	0.46
1:C:330:ASN:HB3	5:C:672:HOH:O	2.15	0.46
1:C:220:ARG:HG3	1:C:220:ARG:NH1	2.31	0.46
1:D:120:ARG:HA	1:D:121:PRO:HD3	1.86	0.46
1:A:20:GLY:HA3	1:A:43:ASN:O	2.16	0.45
1:D:25:ALA:O	1:D:29:LEU:HG	2.16	0.45
1:C:120:ARG:NH1	5:C:780:HOH:O	2.49	0.45
1:D:265:LYS:HD3	1:D:268:GLU:OE1	2.17	0.45
1:A:62:THR:HG22	1:A:77:VAL:CG2	2.40	0.45
1:B:98:GLY:HA3	5:B:642:HOH:O	2.17	0.45
1:A:126:ILE:HG12	1:A:143:VAL:HG21	1.97	0.45
1:B:288:ARG:HG3	1:B:289:PRO:HD2	1.97	0.45
1:C:418:GLY:HA2	5:C:828:HOH:O	2.16	0.45
1:D:6:VAL:HG22	1:D:413:ILE:HD13	1.97	0.45
1:D:220:ARG:HG3	1:D:220:ARG:NH1	2.31	0.45
1:B:7:GLN:HB3	1:B:412:ASN:ND2	2.32	0.45
1:B:287:LYS:HB3	1:B:287:LYS:HE2	1.77	0.45
1:C:138:LEU:N	1:C:138:LEU:HD22	2.32	0.45
1:A:407:ARG:NH1	1:A:413:ILE:O	2.50	0.45
1:B:91:ARG:HG2	1:B:91:ARG:HH11	1.81	0.45
1:D:98:GLY:HA3	5:D:780:HOH:O	2.17	0.45
1:A:7:GLN:HB3	1:A:412:ASN:ND2	2.32	0.45
1:C:334:HIS:HB3	1:C:372:ALA:HB1	1.99	0.45
1:A:169:ILE:HG22	1:A:182:ILE:HD11	1.99	0.45
1:A:419:GLU:HA	1:A:419:GLU:OE1	2.17	0.45
1:B:77:VAL:HB	1:B:104:PHE:CZ	2.52	0.45
1:D:417:LYS:C	1:D:419:GLU:N	2.73	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:243:ALA:HA	1:A:284:MET:CG	2.47	0.44
1:C:402:ILE:CG2	1:C:403:GLU:N	2.80	0.44
1:C:4:PHE:CD1	1:C:413:ILE:HD11	2.52	0.44
1:C:225:VAL:H	2:C:504:EDO:H21	1.82	0.44
1:C:321:GLY:HA2	2:C:503:EDO:H12	2.00	0.44
1:A:91:ARG:HG3	1:A:91:ARG:NH1	2.33	0.44
1:A:353:ILE:HD11	5:A:832:HOH:O	2.17	0.44
1:B:120:ARG:NH2	5:B:714:HOH:O	2.51	0.44
1:D:109:VAL:O	1:D:143:VAL:HG12	2.18	0.44
1:D:137:LYS:HD2	1:D:139:GLU:OE1	2.18	0.44
1:D:85:ASP:HA	1:D:88:LYS:CE	2.48	0.44
1:D:111:LEU:O	1:D:111:LEU:HD12	2.18	0.44
1:D:135:GLU:HB2	5:D:699:HOH:O	2.16	0.44
1:A:315:LEU:HD21	1:A:345:ALA:HB2	1.99	0.44
1:B:87:VAL:HG12	5:B:830:HOH:O	2.16	0.44
1:B:125:HIS:CE1	1:B:164:GLY:C	2.96	0.43
1:D:315:LEU:HD12	1:D:338:LEU:HD13	2.00	0.43
1:A:158:MET:HE3	5:A:601:HOH:O	2.17	0.43
1:D:50:ILE:O	1:D:54:MET:HG3	2.17	0.43
1:B:117:ILE:HD13	2:C:503:EDO:O1	2.18	0.43
1:B:390:ASP:OD2	1:B:391:ARG:N	2.47	0.43
1:A:37:GLU:OE1	1:A:220:ARG:NH2	2.52	0.43
1:A:158:MET:HE2	1:A:182:ILE:HG22	1.97	0.43
1:D:83:PRO:O	1:D:87:VAL:HG13	2.18	0.43
1:D:5:ARG:O	1:D:413:ILE:HD12	2.19	0.43
1:D:316:VAL:HA	1:D:357:VAL:O	2.19	0.43
1:B:138:LEU:HD23	1:D:136:ILE:HB	2.00	0.43
1:B:111:LEU:HA	1:B:112:PRO:HD2	1.82	0.42
1:B:114:GLY:O	1:B:116:ALA:N	2.45	0.42
1:D:320:THR:HG23	1:D:354:CYS:O	2.20	0.42
1:C:150:ARG:NH2	1:C:219:GLU:O	2.44	0.42
1:B:243:ALA:HA	1:B:284:MET:HG3	2.01	0.42
1:D:83:PRO:HB2	1:D:85:ASP:OD1	2.20	0.42
5:A:717:HOH:O	1:C:119:ALA:HB3	2.19	0.42
1:B:282:LEU:C	1:B:282:LEU:HD23	2.45	0.42
1:D:81:SER:HB2	1:D:108:GLN:CG	2.50	0.42
1:A:333:MET:HE1	1:D:347:ILE:HD12	2.01	0.42
1:D:329:GLU:HA	2:D:502:EDO:H21	2.02	0.42
1:B:299:HIS:CG	1:B:300:PRO:HA	2.55	0.42
1:C:15:GLU:CG	1:C:250:VAL:HB	2.39	0.42
1:C:351:THR:HG22	1:C:352:VAL:N	2.35	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:370:LEU:CD1	1:C:395:ILE:HA	2.50	0.42
1:D:363:ALA:O	1:D:387:THR:HG23	2.19	0.42
1:B:169:ILE:HG22	1:B:182:ILE:HD11	2.02	0.42
1:A:337:GLU:CD	1:A:340:ARG:HH21	2.28	0.41
1:B:288:ARG:CG	1:B:289:PRO:HD2	2.50	0.41
1:A:152:LYS:HE3	1:A:177:GLU:OE1	2.19	0.41
1:D:287:LYS:HE3	5:D:835:HOH:O	2.20	0.41
1:C:274[A]:GLU:HG2	5:C:689:HOH:O	2.20	0.41
1:B:9:PRO:HA	1:B:381:CYS:O	2.20	0.41
1:D:346:GLU:OE2	1:D:355:HIS:NE2	2.51	0.41
1:A:39:VAL:CG2	1:A:72:ILE:HB	2.50	0.41
1:B:25:ALA:O	1:B:29:LEU:HG	2.20	0.41
1:C:20:GLY:HA3	1:C:43:ASN:O	2.20	0.41
1:C:76:ASN:HA	5:C:728:HOH:O	2.19	0.41
1:A:142:TYR:CD1	1:A:142:TYR:C	2.99	0.41
1:A:188:GLU:HA	1:A:189:PRO:HD3	1.96	0.41
1:B:401:ARG:HG3	1:B:401:ARG:HH11	1.84	0.41
1:D:243:ALA:HA	1:D:284:MET:CG	2.50	0.41
1:A:136:ILE:HB	1:C:138:LEU:HD23	2.03	0.41
1:A:289:PRO:HG2	1:A:317:ALA:HA	2.01	0.41
1:B:327:ILE:HD12	1:B:327:ILE:N	2.36	0.41
1:A:335:VAL:HB	1:A:336:PRO:HD3	2.03	0.41
1:B:159:ASP:OD2	1:D:119:ALA:HB3	2.20	0.41
1:B:59:GLN:HB3	1:B:86:LEU:HD11	2.03	0.41
1:D:231:ASP:OD1	1:D:231:ASP:C	2.64	0.41
1:D:417:LYS:C	1:D:419:GLU:H	2.29	0.41
1:A:126:ILE:HD13	1:A:138:LEU:HD21	2.02	0.41
1:A:331:ARG:HB3	1:A:331:ARG:CZ	2.51	0.40
1:B:139:GLU:HB3	1:D:135:GLU:HG3	2.03	0.40
1:B:197:PHE:CZ	1:B:201:LEU:HD11	2.56	0.40
1:B:332:PHE:CG	1:B:352:VAL:CG2	3.04	0.40
1:C:4:PHE:CZ	1:C:403:GLU:HB3	2.55	0.40
1:C:233:ILE:HG21	1:C:371:ARG:CZ	2.51	0.40
1:C:407:ARG:NH1	1:C:413:ILE:O	2.53	0.40
1:D:366:MET:HE2	1:D:391:ARG:HH22	1.85	0.40
1:A:289:PRO:HD3	5:A:632:HOH:O	2.20	0.40
1:A:307:GLN:HE21	1:A:331:ARG:NH2	2.19	0.40
1:B:7:GLN:O	1:B:412:ASN:HB3	2.22	0.40
1:B:87:VAL:HG22	1:B:93:SER:HB3	2.02	0.40
1:D:150[B]:ARG:HH12	1:D:219:GLU:C	2.28	0.40
1:A:139:GLU:O	1:A:140:GLU:C	2.63	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:111:LEU:HA	1:B:111:LEU:HD23	1.88	0.40
1:B:407:ARG:NH1	1:B:413:ILE:O	2.55	0.40
1:A:139:GLU:HB2	1:A:142:TYR:CZ	2.57	0.40
1:A:115:CYS:HB2	1:A:140:GLU:CD	2.47	0.40
1:A:328:PHE:HB2	1:A:331:ARG:HD2	2.04	0.40
1:C:370:LEU:HD13	1:C:394:HIS:O	2.22	0.40
1:D:413:ILE:HD12	1:D:414:GLU:N	2.34	0.40

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	416/419 (99%)	404 (97%)	12 (3%)	0	100	100
1	B	415/419 (99%)	395 (95%)	17 (4%)	3 (1%)	18	15
1	C	416/419 (99%)	403 (97%)	10 (2%)	3 (1%)	18	15
1	D	416/419 (99%)	398 (96%)	17 (4%)	1 (0%)	43	44
All	All	1663/1676 (99%)	1600 (96%)	56 (3%)	7 (0%)	30	28

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	115	CYS
1	B	114	GLY
1	C	113	GLY
1	C	120	ARG
1	C	115	CYS
1	B	112	PRO
1	B	418	GLY

### 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	330/329 (100%)	327 (99%)	3 (1%)	70	78
1	B	329/329 (100%)	325 (99%)	4 (1%)	63	72
1	C	330/329 (100%)	329 (100%)	1 (0%)	86	91
1	D	330/329 (100%)	326 (99%)	4 (1%)	63	72
All	All	1319/1316 (100%)	1307 (99%)	12 (1%)	70	78

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	22	LYS
1	A	131	LYS
1	A	417	LYS
1	B	229	LEU
1	B	336	PRO
1	B	397	ARG
1	B	401	ARG
1	C	229	LEU
1	D	87	VAL
1	D	143	VAL
1	D	184	ASN
1	D	370	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	42	GLN
1	A	76	ASN
1	A	108	GLN
1	A	307	GLN
1	A	334	HIS
1	A	344	HIS
1	B	255	GLN

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Mol	Chain	Res	Type
1	C	76	ASN
1	C	255	GLN
1	D	43	ASN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

4 non-standard protein/DNA/RNA residues 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	$\# Z  > 2$
1	IAS	C	67	1	6,7,8	1.01	0	3,8,10	0.99	0
1	IAS	B	67	1	6,7,8	0.94	0	3,8,10	0.97	0
1	IAS	D	67	1	6,7,8	1.07	0	3,8,10	0.89	0
1	IAS	A	67	1	6,7,8	0.99	0	3,8,10	0.96	0

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
1	IAS	C	67	1	-	0/7/7/8	-
1	IAS	B	67	1	-	2/7/7/8	-
1	IAS	D	67	1	-	0/7/7/8	-
1	IAS	A	67	1	-	2/7/7/8	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	67	IAS	O-C-CA-CB
1	B	67	IAS	OXT-C-CA-CB
1	B	67	IAS	O-C-CA-CB
1	A	67	IAS	OXT-C-CA-CB

There are no ring outliers.

No monomer is involved in short contacts.

## 5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

20 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	$\# Z  > 2$
2	EDO	C	504	-	3,3,3	0.40	0	2,2,2	0.39	0
2	EDO	A	501	-	3,3,3	0.46	0	2,2,2	0.35	0
2	EDO	A	503	-	3,3,3	0.40	0	2,2,2	0.39	0
2	EDO	A	502	-	3,3,3	0.41	0	2,2,2	0.37	0
2	EDO	C	505	-	3,3,3	0.43	0	2,2,2	0.37	0
3	ACT	A	505	-	3,3,3	1.08	0	3,3,3	0.86	0
3	ACT	D	504	-	3,3,3	1.05	0	3,3,3	0.80	0
2	EDO	B	501	-	3,3,3	0.48	0	2,2,2	0.33	0
3	ACT	C	506	-	3,3,3	1.07	0	3,3,3	0.87	0
2	EDO	D	503	-	3,3,3	0.51	0	2,2,2	0.32	0
4	UTP	A	506	-	29,30,30	1.11	3 (10%)	43,47,47	0.91	3 (6%)
3	ACT	A	504	-	3,3,3	1.08	0	3,3,3	0.79	0
2	EDO	D	501	-	3,3,3	0.46	0	2,2,2	0.36	0
2	EDO	D	502	-	3,3,3	0.37	0	2,2,2	0.32	0



Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	UTP	B	503	-	29,30,30	1.22	3 (10%)	43,47,47	0.91	2 (4%)
3	ACT	B	502	-	3,3,3	1.09	0	3,3,3	0.88	0
3	ACT	D	505	-	3,3,3	1.14	0	3,3,3	0.76	0
2	EDO	C	503	-	3,3,3	0.37	0	2,2,2	0.43	0
2	EDO	C	501	-	3,3,3	0.44	0	2,2,2	0.37	0
2	EDO	C	502	-	3,3,3	0.43	0	2,2,2	0.37	0

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
2	EDO	B	501	-	-	0/1/1/1	-
2	EDO	C	504	-	-	1/1/1/1	-
2	EDO	A	501	-	-	1/1/1/1	-
2	EDO	D	503	-	-	1/1/1/1	-
4	UTP	A	506	-	-	8/22/38/38	0/2/2/2
2	EDO	A	503	-	-	1/1/1/1	-
4	UTP	B	503	-	-	4/22/38/38	0/2/2/2
2	EDO	C	503	-	-	1/1/1/1	-
2	EDO	D	501	-	-	1/1/1/1	-
2	EDO	D	502	-	-	0/1/1/1	-
2	EDO	A	502	-	-	1/1/1/1	-
2	EDO	C	505	-	-	1/1/1/1	-
2	EDO	C	501	-	-	0/1/1/1	-
2	EDO	C	502	-	-	1/1/1/1	-

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	503	UTP	PA-O3A	4.26	1.64	1.59
4	A	506	UTP	PA-O3A	3.01	1.62	1.59
4	A	506	UTP	C2-N1	2.81	1.42	1.38
4	B	503	UTP	C2-N1	2.47	1.42	1.38
4	A	506	UTP	PB-O1B	-2.08	1.45	1.55
4	B	503	UTP	PB-O1B	-2.01	1.46	1.55

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	503	UTP	O1B-PB-O3A	3.45	116.60	107.27
4	A	506	UTP	O1B-PB-O3A	3.30	116.20	107.27
4	B	503	UTP	O3A-PB-O2B	-2.51	103.16	110.70
4	A	506	UTP	O3A-PB-O2B	-2.25	103.95	110.70
4	A	506	UTP	C3'-C2'-C1'	2.03	105.31	101.46

There are no chirality outliers.

All (21) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	503	UTP	O4'-C4'-C5'-O5'
2	A	502	EDO	O1-C1-C2-O2
2	C	502	EDO	O1-C1-C2-O2
2	C	504	EDO	O1-C1-C2-O2
2	C	505	EDO	O1-C1-C2-O2
2	D	503	EDO	O1-C1-C2-O2
4	B	503	UTP	C3'-C4'-C5'-O5'
2	D	501	EDO	O1-C1-C2-O2
4	A	506	UTP	PB-O3B-PG-O2G
2	A	503	EDO	O1-C1-C2-O2
4	A	506	UTP	PB-O3A-PA-O1A
2	A	501	EDO	O1-C1-C2-O2
4	A	506	UTP	O4'-C4'-C5'-O5'
2	C	503	EDO	O1-C1-C2-O2
4	B	503	UTP	PB-O3A-PA-O1A
4	A	506	UTP	PB-O3B-PG-O1G
4	A	506	UTP	PB-O3B-PG-O3G
4	A	506	UTP	PB-O3A-PA-O2A
4	A	506	UTP	PA-O3A-PB-O1B
4	A	506	UTP	PA-O3A-PB-O2B
4	B	503	UTP	PB-O3A-PA-O2A

There are no ring outliers.

7 monomers are involved in 13 short contacts:

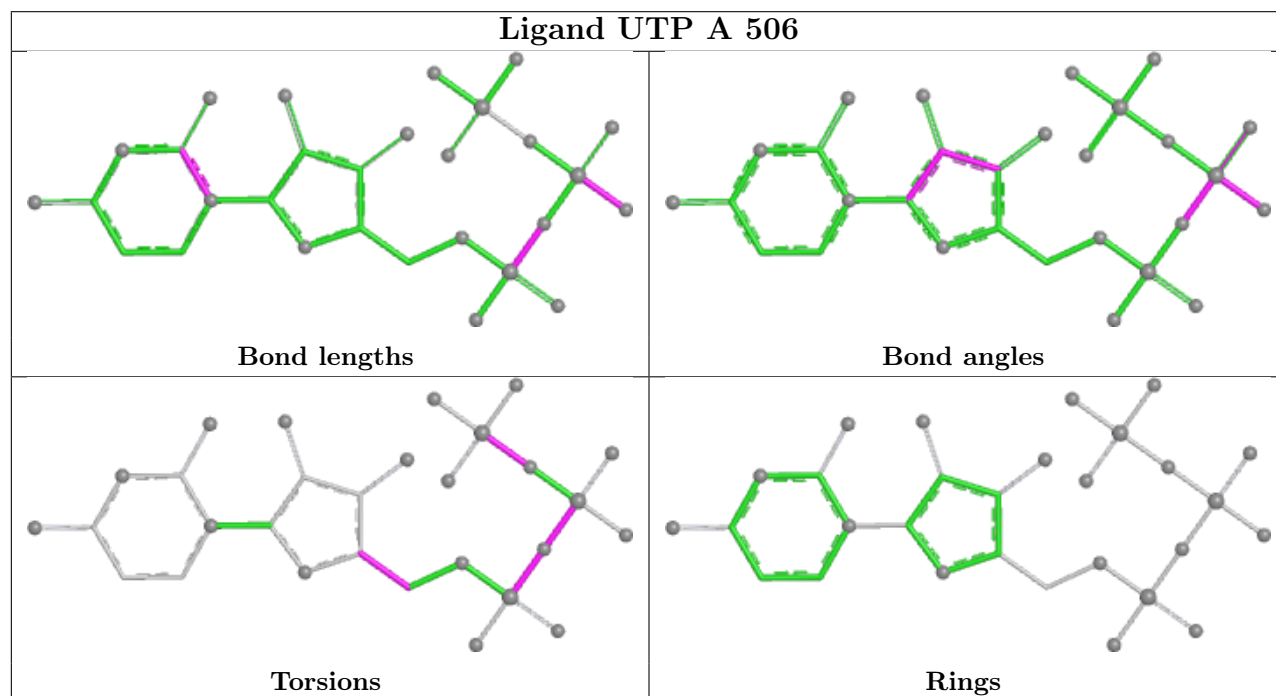
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	504	EDO	1	0
2	A	503	EDO	1	0
2	C	505	EDO	3	0
2	D	502	EDO	2	0
3	B	502	ACT	1	0
2	C	503	EDO	3	0

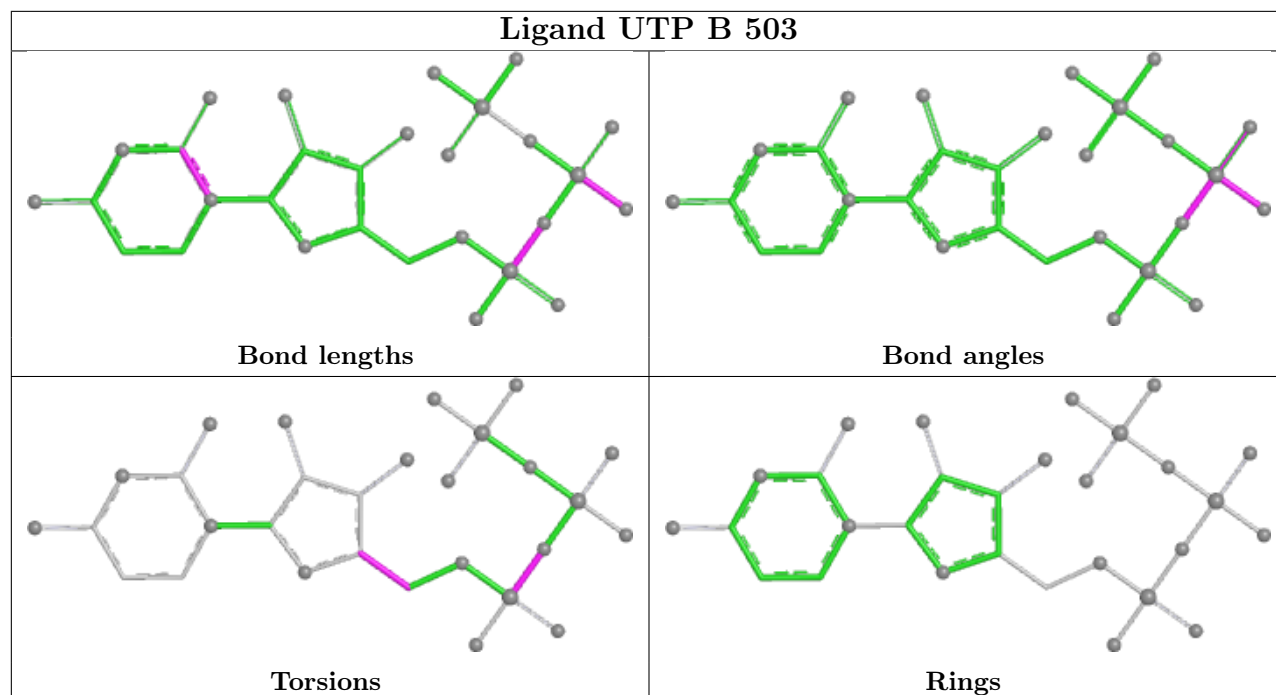
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Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	501	EDO	2	0

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

### 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	418/419 (99%)	-0.17	5 (1%) 76 78	16, 28, 43, 69	1 (0%)
1	B	418/419 (99%)	-0.05	12 (2%) 53 56	17, 28, 46, 79	0
1	C	418/419 (99%)	-0.15	4 (0%) 79 81	16, 27, 46, 73	1 (0%)
1	D	418/419 (99%)	-0.11	7 (1%) 69 71	15, 26, 45, 78	1 (0%)
All	All	1672/1676 (99%)	-0.12	28 (1%) 69 71	15, 27, 45, 79	3 (0%)

All (28) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	86	LEU	4.2
1	B	112	PRO	4.1
1	B	418	GLY	3.7
1	D	119	ALA	3.7
1	B	78	ASN	3.2
1	A	113	GLY	3.0
1	A	418	GLY	2.9
1	B	89	THR	2.8
1	C	78	ASN	2.7
1	B	115	CYS	2.7
1	C	121	PRO	2.6
1	D	141	GLY	2.6
1	B	419	GLU	2.5
1	C	55	LYS	2.4
1	A	116	ALA	2.4
1	B	111	LEU	2.3
1	B	84	TYR	2.3
1	D	88	LYS	2.2
1	B	86	LEU	2.2
1	D	416	VAL	2.2
1	C	418	GLY	2.2

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Mol	Chain	Res	Type	RSRZ
1	D	418	GLY	2.2
1	D	419	GLU	2.1
1	A	78	ASN	2.1
1	B	116	ALA	2.1
1	A	419	GLU	2.1
1	B	85	ASP	2.1
1	B	87	VAL	2.1

## 6.2 Non-standard residues in protein, DNA, RNA chains [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
1	IAS	B	67	8/9	0.88	0.08	36,37,39,40	0
1	IAS	C	67	8/9	0.88	0.10	35,36,37,39	0
1	IAS	A	67	8/9	0.90	0.08	35,37,39,39	0
1	IAS	D	67	8/9	0.93	0.07	20,22,24,24	0

## 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.

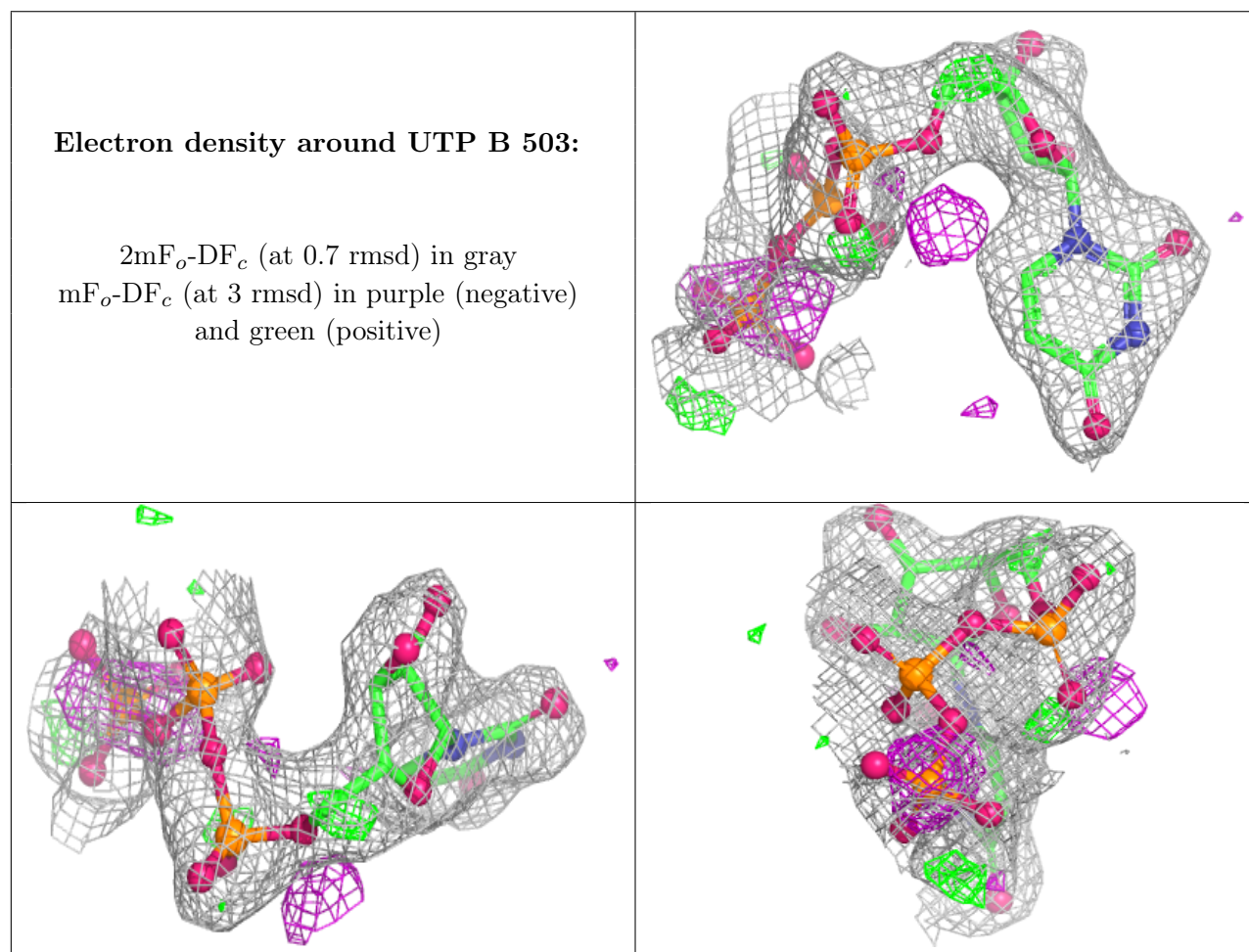
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	EDO	B	501	4/4	0.71	0.18	55,57,57,58	0
3	ACT	D	504	4/4	0.71	0.24	75,75,75,75	0
2	EDO	C	504	4/4	0.74	0.12	65,66,66,66	0
3	ACT	A	505	4/4	0.75	0.14	76,76,76,76	0
2	EDO	C	501	4/4	0.75	0.15	60,60,60,60	0
4	UTP	B	503	29/29	0.77	0.14	60,68,92,92	0
4	UTP	A	506	29/29	0.79	0.13	40,52,77,78	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	EDO	D	503	4/4	0.83	0.12	41,44,44,44	0
3	ACT	D	505	4/4	0.84	0.12	51,51,51,52	0
3	ACT	B	502	4/4	0.84	0.13	47,47,48,49	0
2	EDO	C	502	4/4	0.84	0.14	63,63,63,63	0
2	EDO	D	501	4/4	0.85	0.13	52,53,54,54	0
2	EDO	A	501	4/4	0.86	0.11	44,46,46,48	0
2	EDO	A	503	4/4	0.87	0.14	35,36,36,37	0
2	EDO	C	505	4/4	0.89	0.08	48,49,50,50	0
3	ACT	C	506	4/4	0.89	0.10	49,50,50,50	0
2	EDO	C	503	4/4	0.90	0.13	39,41,43,45	0
3	ACT	A	504	4/4	0.91	0.13	60,61,61,62	0
2	EDO	A	502	4/4	0.91	0.11	42,43,44,44	0
2	EDO	D	502	4/4	0.93	0.10	36,37,37,38	0

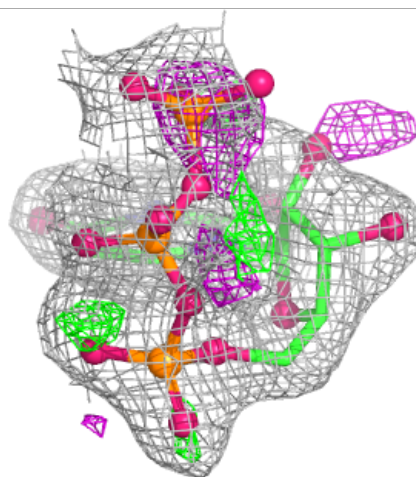
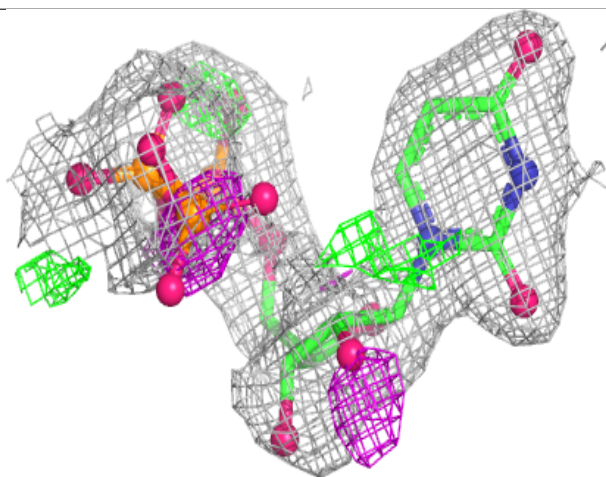
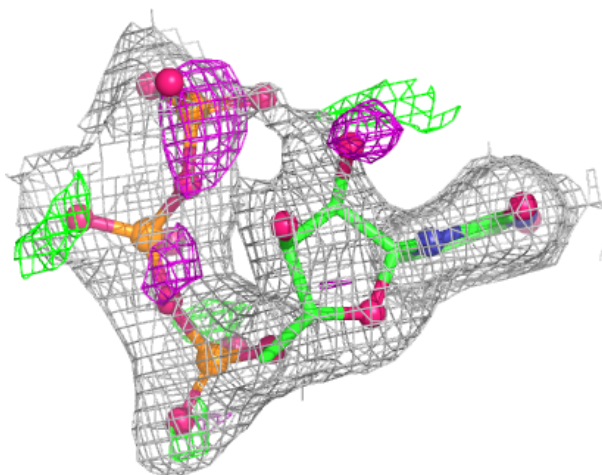
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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





**Electron density around UTP A 506:**

$2mF_o-DF_c$  (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.