



# wwPDB X-ray Structure Validation Summary Report ⓘ

Dec 15, 2024 – 09:40 AM EST

PDB ID : 6D89  
Title : Bacteroides uniformis beta-glucuronidase 1 with N-terminal loop deletion  
Authors : Walton, W.G.; Pellock, S.J.; Redinbo, M.R.  
Deposited on : 2018-04-26  
Resolution : 2.00 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 : 4.02b-467  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 1.21  
EDS : 3.0  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.004 (Gargrove)  
Density-Fitness : 1.0.11  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.40

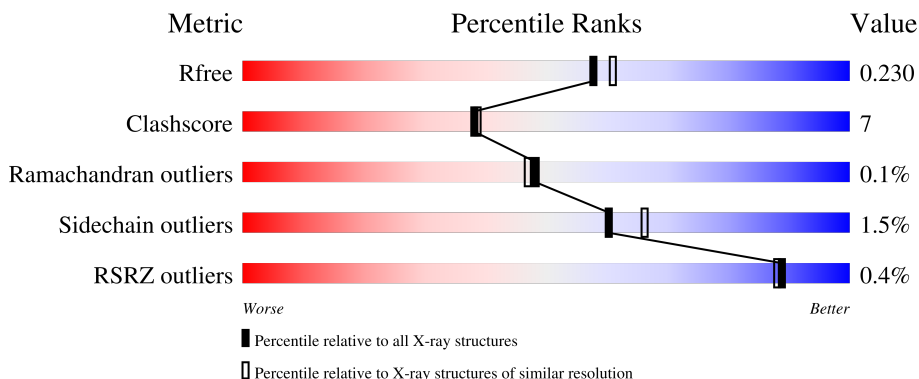
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.00 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))
$R_{free}$	164625	9409 (2.00-2.00)
Clashscore	180529	10737 (2.00-2.00)
Ramachandran outliers	177936	10628 (2.00-2.00)
Sidechain outliers	177891	10627 (2.00-2.00)
RSRZ outliers	164620	9409 (2.00-2.00)

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	595	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, grey);"></div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>84%</span> <span>11%</span> <span>• •</span> </div> </div>
1	B	595	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, orange, red, grey);"></div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>82%</span> <span>13%</span> <span>• 5%</span> </div> </div>
1	C	595	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, orange, red, grey);"></div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>80%</span> <span>15%</span> <span>•</span> </div> </div>
1	D	595	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, orange, red, grey);"></div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>81%</span> <span>14%</span> <span>• •</span> </div> </div>

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 20593 atoms, of which 20 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 Beta-galactosidase/beta-glucuronidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	C	571	Total	C	N	O	S	0	1	0
			4678	2994	801	869	14			
1	D	571	Total	C	N	O	S	0	1	0
			4697	3009	803	871	14			
1	A	571	Total	C	N	O	S	0	2	0
			4702	3012	804	872	14			
1	B	568	Total	C	N	O	S	0	0	0
			4660	2987	796	863	14			

There are 32 discrepancies between the modelled and reference sequences:

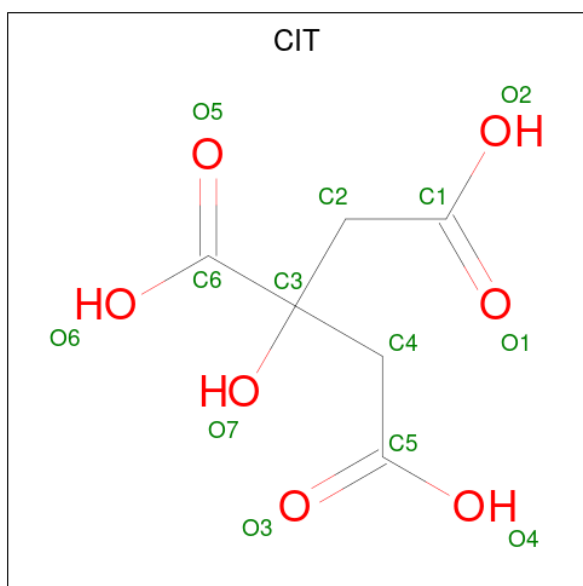
Chain	Residue	Modelled	Actual	Comment	Reference
C	54	ARG	-	linker	UNP A0A174CQK8
C	55	GLY	-	linker	UNP A0A174CQK8
C	56	MET	-	linker	UNP A0A174CQK8
C	57	LYS	-	linker	UNP A0A174CQK8
C	58	VAL	-	linker	UNP A0A174CQK8
C	59	TYR	-	linker	UNP A0A174CQK8
C	418	LYS	GLU	conflict	UNP A0A174CQK8
C	509	HIS	ARG	conflict	UNP A0A174CQK8
D	54	ARG	-	linker	UNP A0A174CQK8
D	55	GLY	-	linker	UNP A0A174CQK8
D	56	MET	-	linker	UNP A0A174CQK8
D	57	LYS	-	linker	UNP A0A174CQK8
D	58	VAL	-	linker	UNP A0A174CQK8
D	59	TYR	-	linker	UNP A0A174CQK8
D	418	LYS	GLU	conflict	UNP A0A174CQK8
D	509	HIS	ARG	conflict	UNP A0A174CQK8
A	54	ARG	-	linker	UNP A0A174CQK8
A	55	GLY	-	linker	UNP A0A174CQK8
A	56	MET	-	linker	UNP A0A174CQK8
A	57	LYS	-	linker	UNP A0A174CQK8
A	58	VAL	-	linker	UNP A0A174CQK8

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Chain	Residue	Modelled	Actual	Comment	Reference
A	59	TYR	-	linker	UNP A0A174CQK8
A	418	LYS	GLU	conflict	UNP A0A174CQK8
A	509	HIS	ARG	conflict	UNP A0A174CQK8
B	54	ARG	-	linker	UNP A0A174CQK8
B	55	GLY	-	linker	UNP A0A174CQK8
B	56	MET	-	linker	UNP A0A174CQK8
B	57	LYS	-	linker	UNP A0A174CQK8
B	58	VAL	-	linker	UNP A0A174CQK8
B	59	TYR	-	linker	UNP A0A174CQK8
B	418	LYS	GLU	conflict	UNP A0A174CQK8
B	509	HIS	ARG	conflict	UNP A0A174CQK8

- Molecule 2 is CITRIC ACID (three-letter code: CIT) (formula:  $C_6H_8O_7$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	C	1	Total	C	H	O	0	0
			18	6	5	7		
2	D	1	Total	C	H	O	0	0
			18	6	5	7		
2	A	1	Total	C	H	O	0	0
			18	6	5	7		
2	B	1	Total	C	H	O	0	0
			18	6	5	7		

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula:  $Cl$ ).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	C	1	Total 1	Cl 1	0	0
3	D	1	Total 1	Cl 1	0	0
3	A	1	Total 1	Cl 1	0	0
3	B	1	Total 1	Cl 1	0	0

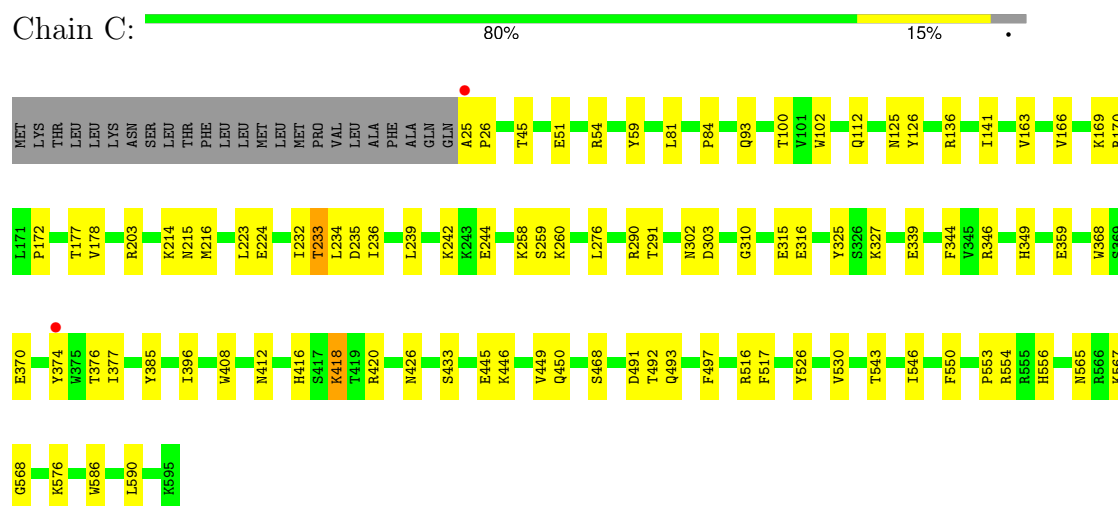
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	C	392	Total 392	O 392	0	0
4	D	470	Total 470	O 470	0	0
4	A	449	Total 449	O 449	0	0
4	B	469	Total 469	O 469	0	0

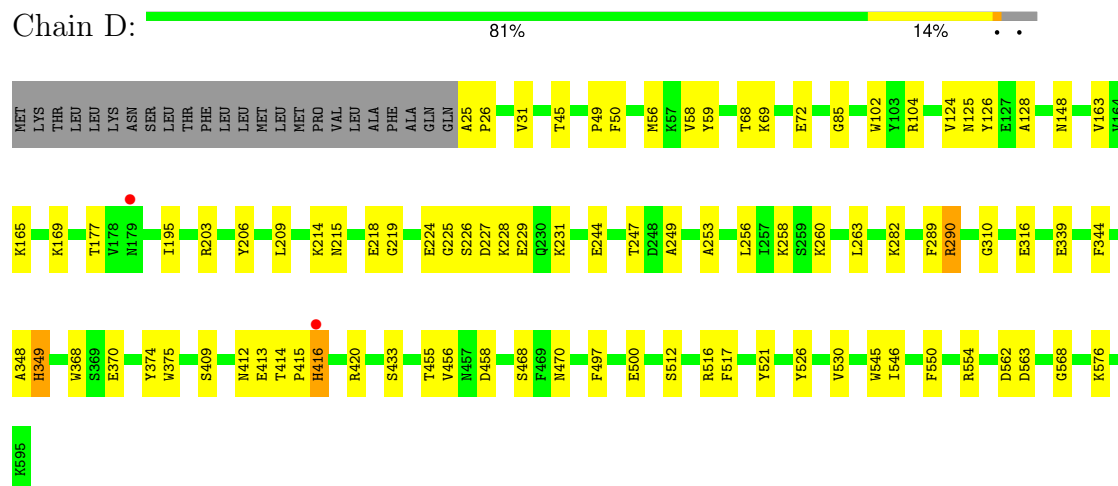
### 3 Residue-property plots

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.

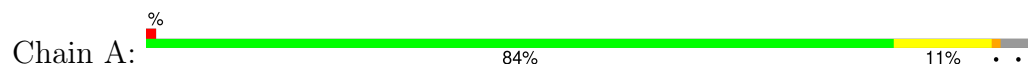
- Molecule 1: Beta-galactosidase/beta-glucuronidase

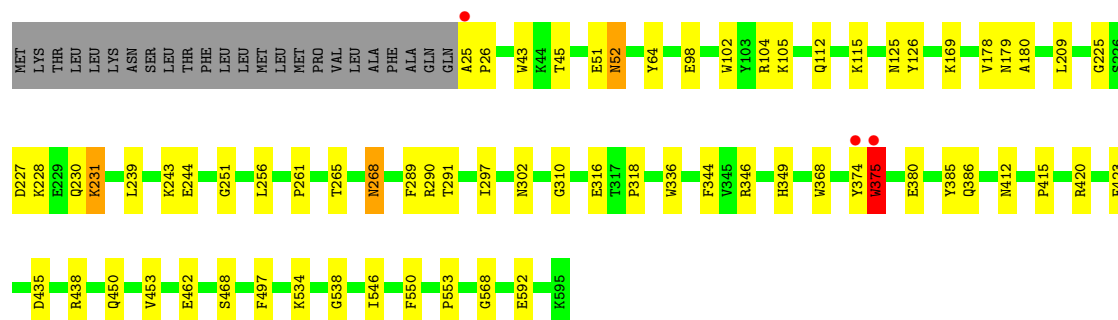


- Molecule 1: Beta-galactosidase/beta-glucuronidase



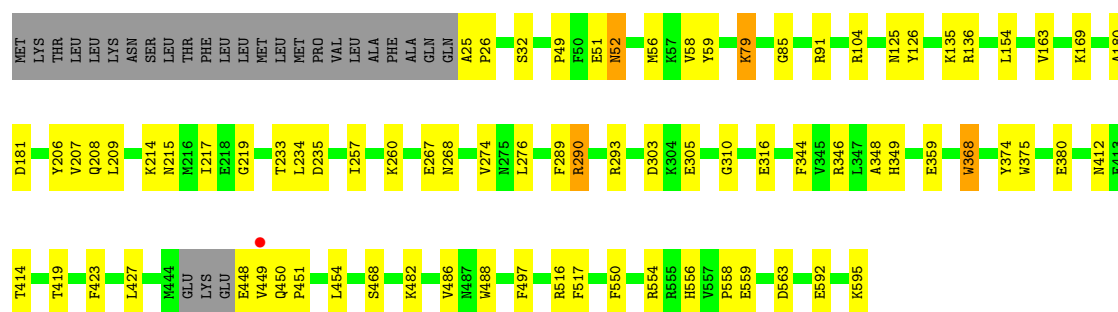
- Molecule 1: Beta-galactosidase/beta-glucuronidase





• Molecule 1: Beta-galactosidase/beta-glucuronidase

Chain B: 82% 13% 5%



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	76.65Å 199.19Å 84.62Å 90.00° 102.81° 90.00°	Depositor
Resolution (Å)	29.34 – 2.00 29.34 – 2.00	Depositor EDS
% Data completeness (in resolution range)	98.1 (29.34-2.00) 98.0 (29.34-2.00)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.93 (at 2.00Å)	Xtriage
Refinement program	PHENIX 1.13_2998	Depositor
R, $R_{free}$	0.176 , 0.230 0.176 , 0.230	Depositor DCC
$R_{free}$ test set	164099 reflections (1.22%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	24.9	Xtriage
Anisotropy	0.615	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 41.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	20593	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.08% 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: CIT, CL

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	A	0.37	0/4829	0.53	0/6545
1	B	0.39	0/4782	0.56	0/6480
1	C	0.37	0/4802	0.55	0/6506
1	D	0.38	0/4821	0.54	0/6533
All	All	0.38	0/19234	0.55	0/26064

There are no bond length outliers.

There are no bond angle outliers.

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	4702	0	4610	52	0
1	B	4660	0	4571	63	0
1	C	4678	0	4589	78	0
1	D	4697	0	4603	65	0
2	A	13	5	5	0	0
2	B	13	5	5	0	0
2	C	13	5	5	0	0
2	D	13	5	5	4	0
3	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	449	0	0	7	1
4	B	469	0	0	10	0
4	C	392	0	0	11	1
4	D	470	0	0	7	0
All	All	20573	20	18393	254	1

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 7.

The worst 5 of 254 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:418:LYS:H	1:C:418:LYS:HD2	1.30	0.97
1:C:233:THR:HG23	1:C:244:GLU:HG2	1.56	0.85
1:D:214:LYS:HG2	1:D:263:LEU:HD11	1.59	0.84
1:C:51:GLU:OE2	1:C:169:LYS:HE2	1.82	0.79
1:A:51:GLU:OE2	1:A:169:LYS:HE2	1.84	0.78

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:C:715:HOH:O	4:A:706:HOH:O[1_554]	2.04	0.16

## 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	571/595 (96%)	552 (97%)	18 (3%)	1 (0%)	44	42
1	B	564/595 (95%)	543 (96%)	21 (4%)	0	100	100
1	C	570/595 (96%)	547 (96%)	23 (4%)	0	100	100
1	D	570/595 (96%)	549 (96%)	20 (4%)	1 (0%)	44	42
All	All	2275/2380 (96%)	2191 (96%)	82 (4%)	2 (0%)	48	47

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	227	ASP
1	A	375	TRP

### 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	508/528 (96%)	499 (98%)	9 (2%)	54	59
1	B	503/528 (95%)	497 (99%)	6 (1%)	67	73
1	C	505/528 (96%)	498 (99%)	7 (1%)	62	68
1	D	507/528 (96%)	496 (98%)	11 (2%)	47	51
All	All	2023/2112 (96%)	1990 (98%)	33 (2%)	60	64

5 of 33 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	79	LYS
1	B	104	ARG
1	B	368	TRP
1	D	349[B]	HIS
1	D	349[A]	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	416	HIS

### 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 [i](#)

Of 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 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	$\# Z  > 2$
2	CIT	B	601	-	12,12,12	1.13	0	17,17,17	1.63	2 (11%)
2	CIT	D	601	-	12,12,12	1.22	0	17,17,17	1.39	1 (5%)
2	CIT	C	601	-	12,12,12	1.20	0	17,17,17	1.36	1 (5%)
2	CIT	A	601	-	12,12,12	1.10	0	17,17,17	1.69	5 (29%)

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	CIT	B	601	-	-	5/16/16/16	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	CIT	D	601	-	-	8/16/16/16	-
2	CIT	C	601	-	-	8/16/16/16	-
2	CIT	A	601	-	-	5/16/16/16	-

There are no bond length outliers.

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	601	CIT	O6-C6-C3	4.74	122.23	113.14
2	A	601	CIT	O6-C6-C3	4.29	121.37	113.14
2	C	601	CIT	O6-C6-C3	3.52	119.89	113.14
2	D	601	CIT	O6-C6-C3	3.32	119.50	113.14
2	A	601	CIT	O4-C5-C4	2.59	122.54	114.35

There are no chirality outliers.

5 of 26 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	601	CIT	C2-C3-C4-C5
2	B	601	CIT	O7-C3-C4-C5
2	B	601	CIT	C6-C3-C4-C5
2	C	601	CIT	C4-C3-C6-O5
2	D	601	CIT	C4-C3-C6-O5

There are no ring outliers.

1 monomer is involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	601	CIT	4	0

## 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, 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	571/595 (95%)	-0.36	3 (0%) 87 86	15, 29, 48, 58	2 (0%)
1	B	568/595 (95%)	-0.44	1 (0%) 92 91	17, 27, 42, 56	0
1	C	571/595 (95%)	-0.36	2 (0%) 89 88	16, 29, 46, 62	1 (0%)
1	D	571/595 (95%)	-0.49	2 (0%) 89 88	13, 27, 42, 62	1 (0%)
All	All	2281/2380 (95%)	-0.41	8 (0%) 89 88	13, 28, 45, 62	4 (0%)

The worst 5 of 8 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	374	TYR	3.9
1	A	375	TRP	3.6
1	A	374	TYR	2.4
1	D	179	ASN	2.3
1	D	416	HIS	2.3

### 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 monosaccharides 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( $\text{\AA}^2$ )	Q<0.9
2	CIT	B	601	13/13	0.85	0.11	28,43,51,51	0
2	CIT	A	601	13/13	0.87	0.10	25,35,45,48	0
2	CIT	D	601	13/13	0.89	0.08	28,34,40,41	0
2	CIT	C	601	13/13	0.93	0.06	24,32,41,41	0
3	CL	C	602	1/1	0.99	0.04	20,20,20,20	0
3	CL	D	602	1/1	0.99	0.03	26,26,26,26	0
3	CL	A	602	1/1	0.99	0.02	22,22,22,22	0
3	CL	B	602	1/1	0.99	0.05	27,27,27,27	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.