



# Full wwPDB X-ray Structure Validation Report ⓘ

Apr 25, 2026 – 05:56 PM EDT

PDB ID : 6UUI / pdb\_00006uui  
Title : Crystal structure of the heterocomplex between coil 2B domains of wild-type keratin 1 (KRT1) and keratin 10 (KRT10) containing mutation Cys401Ala  
Authors : Lomakin, I.B.; Bunick, C.G.  
Deposited on : 2019-10-30  
Resolution : 2.07 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)  
Xtrriage (Phenix) : 2.0  
EDS : 3.0  
Buster-report : wwPDB partial adaption of 1.1.7 (2018)  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

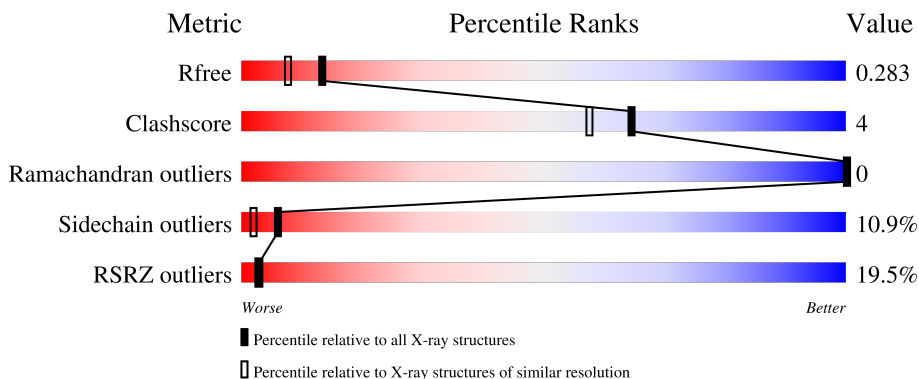
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.07 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	3774 (2.08-2.04)
Clashscore	190562	3883 (2.08-2.04)
Ramachandran outliers	187476	3860 (2.08-2.04)
Sidechain outliers	187428	3860 (2.08-2.04)
RSRZ outliers	180081	3775 (2.08-2.04)

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	C	120	 21% 74% 12% • 11%
2	X	122	 14% 74% 14% • 11%

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 3678 atoms, of which 1792 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 Keratin, type II cytoskeletal 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
1	C	107	1766	531	888	168	178	1	0	2	0

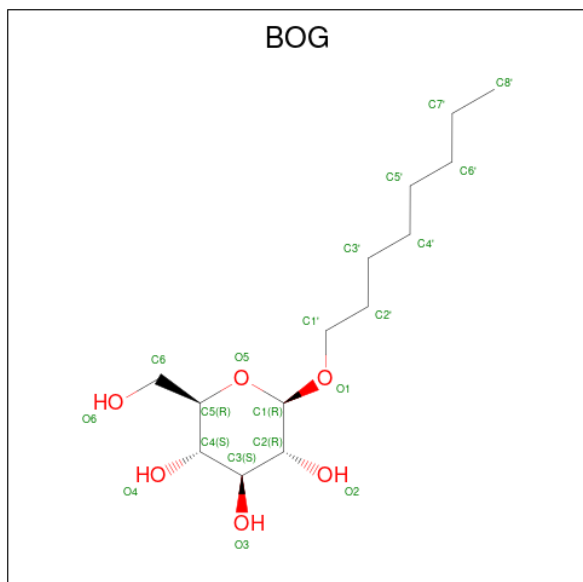
- Molecule 2 is a protein called Keratin, type I cytoskeletal 10.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
2	X	108	1743	536	868	150	188	1	0	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
X	335	GLY	-	expression tag	UNP P13645
X	336	SER	-	expression tag	UNP P13645
X	401	ALA	CYS	engineered mutation	UNP P13645

- Molecule 3 is octyl beta-D-glucopyranoside (CCD ID: BOG) (formula:  $C_{14}H_{28}O_6$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	O		
3	C	1	48	14	28	6	0	0

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	O		
4	X	1	14	3	8	3	0	0

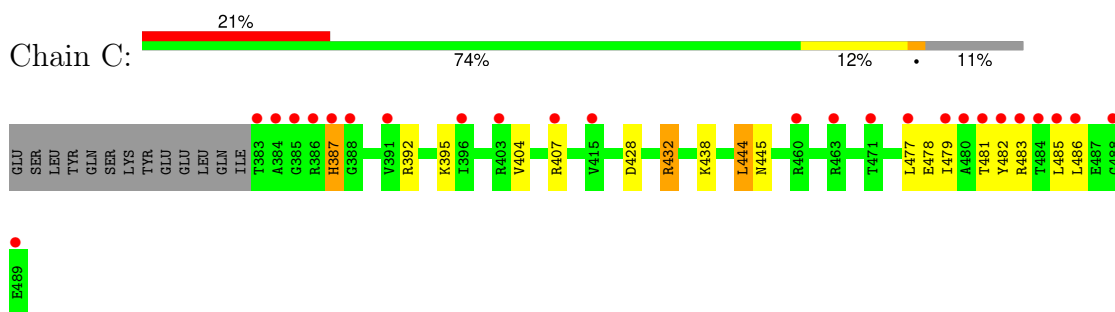
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	C	62	62	62	0	0
5	X	45	45	45	0	0

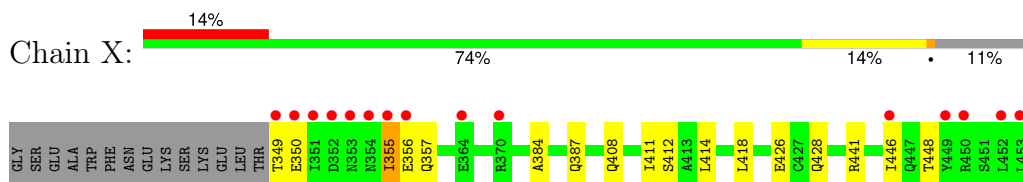
### 3 Residue-property plots [i](#)

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

- Molecule 1: Keratin, type II cytoskeletal 1



- Molecule 2: Keratin, type I cytoskeletal 10



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	100.12Å 100.12Å 224.79Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	48.86 – 2.07 48.86 – 2.07	Depositor EDS
% Data completeness (in resolution range)	99.3 (48.86-2.07) 99.5 (48.86-2.07)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.40 (at 2.07Å)	Xtrriage
Refinement program	PHENIX 1.10.1_2155	Depositor
R, $R_{free}$	0.250 , 0.277 0.258 , 0.283	Depositor DCC
$R_{free}$ test set	2066 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	56.1	Xtrriage
Anisotropy	0.327	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.38 , 93.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.45$ , $\langle L^2 \rangle = 0.27$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	3678	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	123.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.48% 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

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, BOG

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	C	0.22	0/880	0.37	0/1177
2	X	0.19	0/878	0.36	0/1183
All	All	0.20	0/1758	0.37	0/2360

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

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	C	878	888	892	10	0
2	X	875	868	868	7	0
3	C	20	28	28	0	0
4	X	6	8	8	1	0
5	C	62	0	0	1	0
5	X	45	0	0	2	0
All	All	1886	1792	1796	14	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.

All (14) 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:395:LYS:NZ	5:C:601:HOH:O	2.35	0.59
2:X:387:GLN:NE2	5:X:602:HOH:O	2.42	0.53
2:X:428:GLN:NE2	5:X:603:HOH:O	2.44	0.51
1:C:428:ASP:HB3	1:C:432:ARG:HH12	1.79	0.48
1:C:479:ILE:CD1	2:X:446:ILE:HD11	2.46	0.45
1:C:392:ARG:HA	1:C:392:ARG:NE	2.31	0.44
1:C:387:HIS:NE2	2:X:355:ILE:CD1	2.81	0.44
1:C:477:LEU:O	1:C:481:THR:HG23	2.18	0.43
1:C:482:TYR:O	1:C:485:LEU:HB2	2.19	0.43
1:C:444:LEU:HB2	2:X:411:ILE:HD11	2.01	0.42
1:C:477:LEU:O	1:C:478:GLU:C	2.63	0.42
1:C:482:TYR:CD1	1:C:482:TYR:N	2.87	0.42
2:X:384:ALA:HB2	4:X:501:GOL:H2	2.03	0.41
2:X:355:ILE:HG22	2:X:356:GLU:N	2.37	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	C	107/120 (89%)	107 (100%)	0	0	100	100
2	X	106/122 (87%)	104 (98%)	2 (2%)	0	100	100
All	All	213/242 (88%)	211 (99%)	2 (1%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

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

resolution.

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	96/107 (90%)	87 (91%)	9 (9%)	8	3
2	X	98/110 (89%)	86 (88%)	12 (12%)	5	1
All	All	194/217 (89%)	173 (89%)	21 (11%)	6	2

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	387	HIS
1	C	404	VAL
1	C	407	ARG
1	C	432	ARG
1	C	438	LYS
1	C	444	LEU
1	C	445	ASN
1	C	483	ARG
1	C	486	LEU
2	X	349	THR
2	X	350	GLU
2	X	355	ILE
2	X	357	GLN
2	X	408	GLN
2	X	412	SER
2	X	414	LEU
2	X	418	LEU
2	X	426	GLU
2	X	441	ARG
2	X	448	THR
2	X	456	GLU

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

Mol	Chain	Res	Type
2	X	417	GLN

### 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](#)

2 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	GOL	X	501	-	5,5,5	0.43	0	5,5,5	0.11	0
3	BOG	C	501	-	20,20,20	1.03	2 (10%)	25,25,25	1.15	4 (16%)

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
4	GOL	X	501	-	-	0/4/4/4	-
3	BOG	C	501	-	-	6/11/31/31	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	501	BOG	O5-C1	3.06	1.49	1.41
3	C	501	BOG	O1-C1	-2.10	1.36	1.40

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	501	BOG	C3-C4-C5	2.27	114.35	110.23
3	C	501	BOG	C1-O5-C5	-2.26	109.30	113.72
3	C	501	BOG	C4-C3-C2	2.08	114.48	110.83
3	C	501	BOG	O1-C1-C2	2.02	111.34	108.27

There are no chirality outliers.

All (6) torsion outliers are listed below:

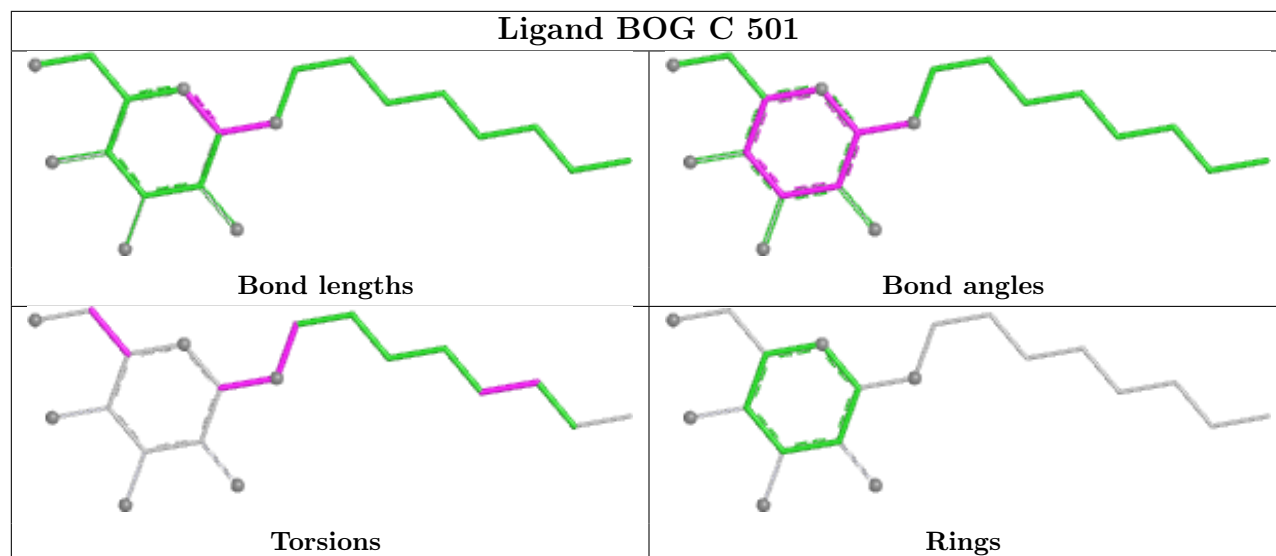
Mol	Chain	Res	Type	Atoms
3	C	501	BOG	O5-C1-O1-C1'
3	C	501	BOG	C2'-C1'-O1-C1
3	C	501	BOG	O5-C5-C6-O6
3	C	501	BOG	C4-C5-C6-O6
3	C	501	BOG	C4'-C5'-C6'-C7'
3	C	501	BOG	C2-C1-O1-C1'

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	X	501	GOL	1	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	C	107/120 (89%)	1.41	25 (23%) <b>2</b>   <b>1</b>	38, 103, 232, 316	2 (1%)
2	X	108/122 (88%)	1.25	17 (15%) <b>5</b>   <b>5</b>	74, 108, 258, 374	0
All	All	215/242 (88%)	1.33	42 (19%) <b>3</b>   <b>3</b>	38, 106, 258, 374	2 (0%)

All (42) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	X	351	ILE	9.2
1	C	403[A]	ARG	8.1
1	C	387	HIS	5.5
2	X	453	LEU	5.0
2	X	355	ILE	5.0
1	C	484	THR	5.0
1	C	482	TYR	4.2
1	C	485	LEU	4.1
1	C	489	GLU	4.0
2	X	349	THR	4.0
1	C	480	ALA	3.9
1	C	384	ALA	3.8
1	C	385	GLY	3.8
2	X	452	LEU	3.7
1	C	488	GLY	3.7
1	C	481	THR	3.6
2	X	446	ILE	3.6
1	C	383	THR	3.4
1	C	486	LEU	3.4
2	X	352	ASP	3.1
1	C	479	ILE	3.1
2	X	456	GLU	3.0
1	C	477	LEU	2.8
1	C	460[A]	ARG	2.7

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Mol	Chain	Res	Type	RSRZ
1	C	463	ARG	2.7
2	X	354	ASN	2.6
1	C	391	VAL	2.6
1	C	396	ILE	2.5
2	X	353	ASN	2.5
1	C	415	VAL	2.4
2	X	370	ARG	2.4
1	C	407	ARG	2.3
1	C	388	GLY	2.3
2	X	356	GLU	2.2
2	X	364	GLU	2.2
1	C	386	ARG	2.2
1	C	471	THR	2.2
1	C	483	ARG	2.2
2	X	350	GLU	2.1
2	X	450	ARG	2.0
2	X	454	GLU	2.0
2	X	449	TYR	2.0

## 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.

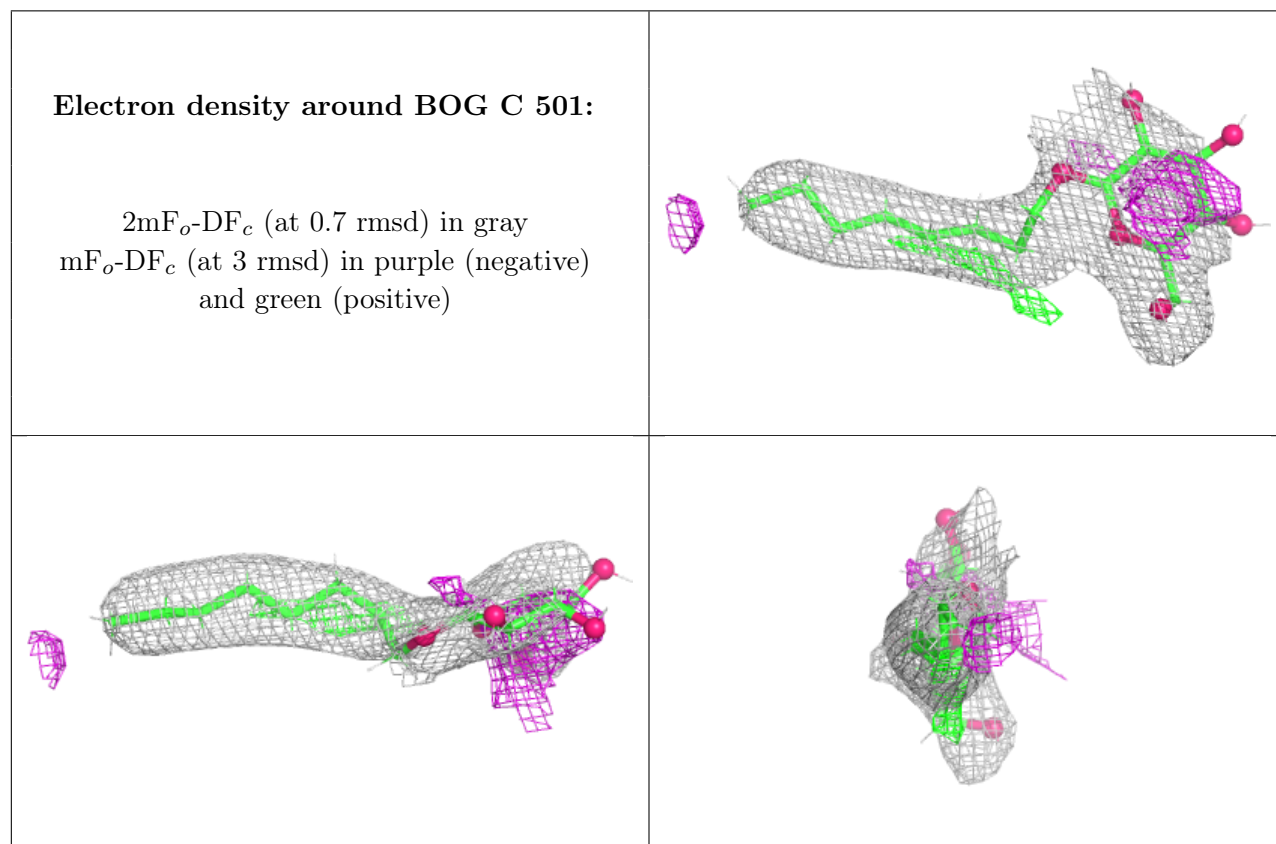
## 6.4 Ligands [i](#)

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
4	GOL	X	501	6/6	0.83	0.30	92,117,129,140	0
3	BOG	C	501	20/20	0.87	0.22	77,147,194,199	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.



## 6.5 Other polymers [i](#)

There are no such residues in this entry.