



# Full wwPDB X-ray Structure Validation Report ⓘ

Nov 1, 2023 – 01:22 PM EDT

PDB ID : 3MZB  
Title : X-ray structure of Nika in complex with the doubly hydroxylated iron complex, 1-O2  
Authors : Cavazza, C.; Bochot, C.; Rousselot-Pailley, P.; Carpentier, P.; Cherrier, M.V.; Martin, L.; Marchi-Delapierre, C.; Fontecilla-Camps, J.C.; Menage, S.  
Deposited on : 2010-05-12  
Resolution : 1.70 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 : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

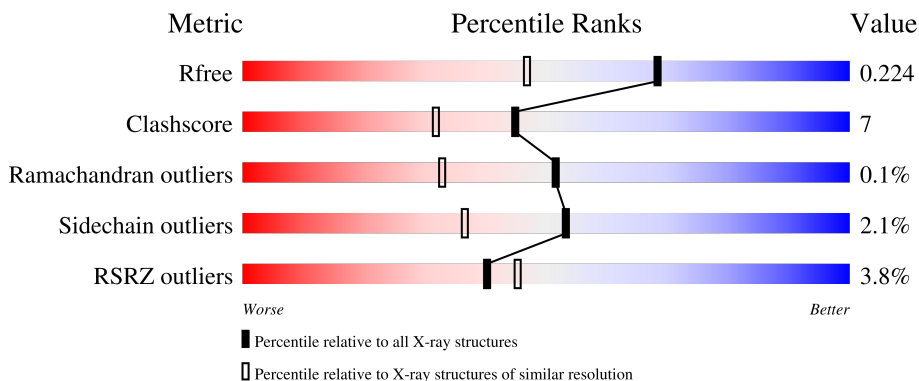
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.70 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))
$R_{free}$	130704	4298 (1.70-1.70)
Clashscore	141614	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)
RSRZ outliers	127900	4222 (1.70-1.70)

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	501	
1	B	501	

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
2	ACT	A	504	-	-	X	-
4	GOL	A	516	-	-	X	-
4	GOL	A	525	-	-	X	-
6	BHR	A	520	-	-	X	-
7	FE	A	521	-	-	X	-

## 2 Entry composition [i](#)

There are 9 unique types of molecules in this entry. The entry contains 8820 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 Nickel-binding periplasmic protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	498	Total 3951	C 2532	N 667	O 742	S 10	20	0	0
1	B	496	Total 3939	C 2524	N 665	O 740	S 10	21	1	0

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



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

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

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total O S 5 4 1	0	0

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

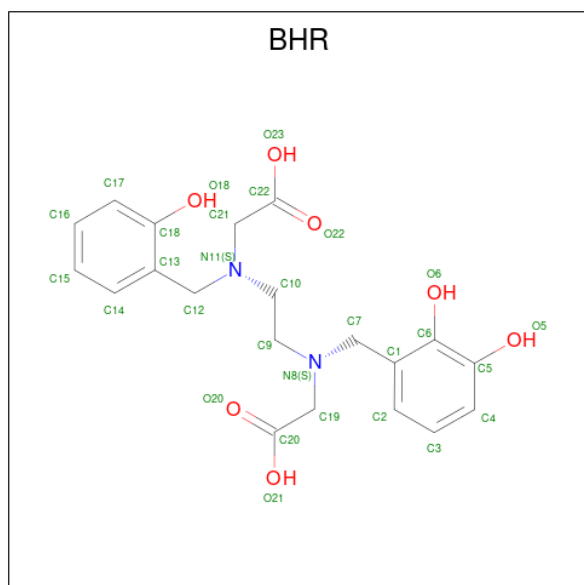


Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0

- Molecule 5 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	4	Total Cl 4 4	0	0
5	B	1	Total Cl 1 1	0	0

- Molecule 6 is 2-[2-[carboxymethyl-[(2-hydroxyphenyl)methyl]amino]ethyl-[(2,3-dihydroxyphenyl)methyl]amino]ethanoic acid (three-letter code: BHR) (formula: C<sub>20</sub>H<sub>24</sub>N<sub>2</sub>O<sub>7</sub>).

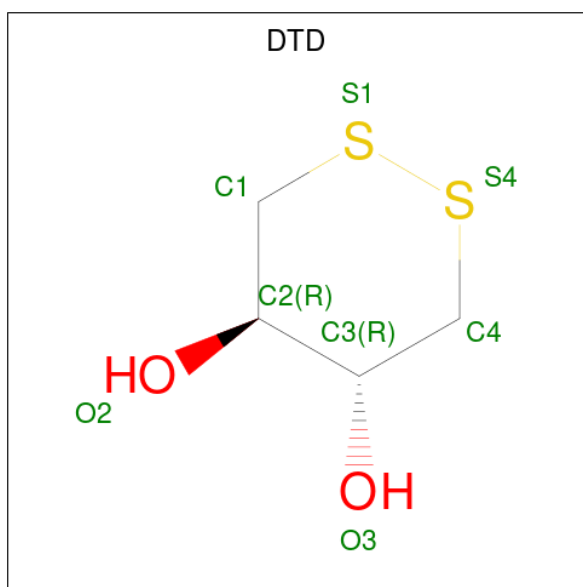


Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total C N O 29 20 2 7	0	0
6	B	1	Total C N O 29 20 2 7	0	0

- Molecule 7 is FE (III) ION (three-letter code: FE) (formula: Fe).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total Fe 1 1	0	0
7	B	1	Total Fe 1 1	0	0

- Molecule 8 is DITHIANE DIOL (three-letter code: DTD) (formula: C<sub>4</sub>H<sub>8</sub>O<sub>2</sub>S<sub>2</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
8	A	1	Total	C	O	S	0	0
			8	4	2	2		
8	B	1	Total	C	O	S	0	0
			8	4	2	2		

- Molecule 9 is water.

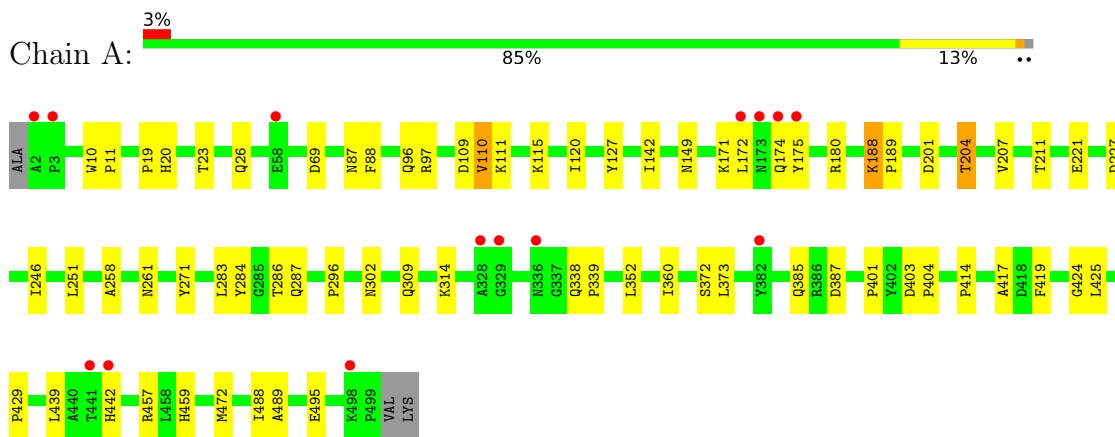
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	408	Total	O	0	0
			408	408		
9	B	314	Total	O	0	0
			314	314		



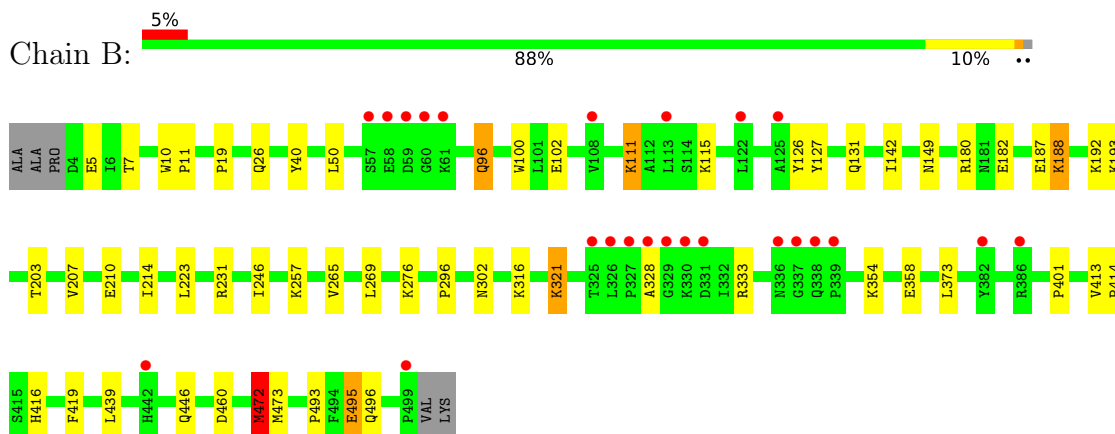
### 3 Residue-property plots [i](#)

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: Nickel-binding periplasmic protein



- Molecule 1: Nickel-binding periplasmic protein



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	87.04Å 93.87Å 124.73Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.93 – 1.70 46.94 – 1.70	Depositor EDS
% Data completeness (in resolution range)	100.0 (46.93-1.70) 98.6 (46.94-1.70)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.22 (at 1.70Å)	Xtrriage
Refinement program	REFMAC 5.5.0109	Depositor
R, $R_{free}$	0.187 , 0.223 0.187 , 0.224	Depositor DCC
$R_{free}$ test set	5562 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	19.8	Xtrriage
Anisotropy	0.295	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.40 , 49.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	8820	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	23.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.09% 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: GOL, BHR, FE, ACT, SO4, DTD, 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	0.56	3/4055 (0.1%)	0.66	0/5525
1	B	0.60	5/4042 (0.1%)	0.68	3/5506 (0.1%)
All	All	0.58	8/8097 (0.1%)	0.67	3/11031 (0.0%)

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	111	LYS	CG-CD	-13.90	1.05	1.52
1	A	188	LYS	CE-NZ	10.93	1.76	1.49
1	B	115	LYS	CB-CG	10.48	1.80	1.52
1	B	321	LYS	CE-NZ	-9.40	1.25	1.49
1	B	187	GLU	CB-CG	-9.06	1.34	1.52
1	B	276	LYS	CB-CG	-7.06	1.33	1.52
1	A	115	LYS	CG-CD	-5.43	1.33	1.52
1	A	96	GLN	CB-CG	5.14	1.66	1.52

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	111	LYS	CB-CG-CD	19.86	163.25	111.60
1	B	276	LYS	CA-CB-CG	6.42	127.51	113.40
1	B	472	MET	CG-SD-CE	5.40	108.83	100.20

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	A	3951	0	3897	59	1
1	B	3939	0	3879	36	1
2	A	28	0	21	3	0
2	B	16	0	12	1	0
3	A	5	0	0	0	0
4	A	60	0	80	14	0
4	B	18	0	24	3	0
5	A	4	0	0	0	0
5	B	1	0	0	0	0
6	A	29	0	20	13	0
6	B	29	0	20	1	0
7	A	1	0	0	2	0
7	B	1	0	0	1	0
8	A	8	0	8	1	0
8	B	8	0	8	1	0
9	A	408	0	0	10	1
9	B	314	0	0	8	1
All	All	8820	0	7969	104	2

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.

All (104) 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:A:287:GLN:NE2	9:A:868:HOH:O	1.87	1.06
1:A:69:ASP:HA	4:A:514:GOL:H12	1.39	1.03
1:A:149:ASN:H	4:A:511:GOL:H11	1.20	1.03
1:A:97:ARG:HH22	6:A:520:BHR:C14	1.77	0.97
1:A:201:ASP:HB3	1:A:204:THR:HG23	1.46	0.95
1:A:97:ARG:HH22	6:A:520:BHR:H14	1.32	0.91
6:A:520:BHR:O6	7:A:521:FE:FE	1.22	0.90
6:A:520:BHR:H17	9:A:582:HOH:O	1.77	0.83
6:A:520:BHR:O18	7:A:521:FE:FE	1.29	0.83
1:A:97:ARG:HH22	6:A:520:BHR:C15	1.93	0.80

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:231:ARG:NH2	9:B:861:HOH:O	2.15	0.79
4:A:511:GOL:H31	9:A:932:HOH:O	1.84	0.78
6:A:520:BHR:O6	6:A:520:BHR:O18	2.02	0.78
1:A:459:HIS:CE1	2:A:502:ACT:H3	2.20	0.77
1:A:283:LEU:HD23	1:A:352:LEU:HD11	1.67	0.76
1:A:97:ARG:NH2	6:A:520:BHR:H15	2.01	0.76
1:A:10:TRP:HE1	1:A:26:GLN:HE21	1.35	0.74
1:B:149:ASN:OD1	9:B:848:HOH:O	2.06	0.73
1:A:109:ASP:OD1	1:A:111:LYS:HE3	1.89	0.72
1:A:110:VAL:HG12	1:A:120:ILE:HG12	1.72	0.72
1:B:10:TRP:HE1	1:B:26:GLN:HE21	1.36	0.71
1:A:495:GLU:OE2	9:A:865:HOH:O	2.08	0.71
1:B:180:ARG:NH1	1:B:182:GLU:OE1	2.23	0.70
1:B:416:HIS:HD2	9:B:798:HOH:O	1.76	0.69
1:B:180:ARG:HH21	1:B:192:LYS:HG2	1.58	0.68
1:A:221:GLU:HB2	9:A:868:HOH:O	1.93	0.68
1:B:131:GLN:OE1	9:B:854:HOH:O	2.13	0.67
1:A:149:ASN:N	4:A:511:GOL:H11	2.03	0.66
1:A:283:LEU:CD2	1:A:352:LEU:HD11	2.26	0.65
1:A:87:ASN:HD21	1:A:142:ILE:H	1.45	0.63
1:B:180:ARG:HD2	1:B:188:LYS:HG3	1.78	0.63
1:A:171:LYS:HB2	1:A:174:GLN:HB2	1.81	0.63
1:B:246:ILE:HD13	1:B:472:MET:HE3	1.81	0.61
1:A:97:ARG:NH2	6:A:520:BHR:C15	2.57	0.60
1:A:227:ASP:HB3	1:A:284:TYR:CZ	2.36	0.60
4:A:516:GOL:H32	9:A:660:HOH:O	2.02	0.60
1:B:495:GLU:H	1:B:495:GLU:CD	2.05	0.59
1:B:203:THR:HG22	2:B:503:ACT:H2	1.85	0.59
1:A:425:LEU:HD23	4:A:516:GOL:H31	1.85	0.59
1:A:172:LEU:O	1:A:174:GLN:OE1	2.21	0.59
1:A:296:PRO:HB3	1:A:302:ASN:HD22	1.68	0.58
6:B:506:BHR:O18	7:B:507:FE:FE	1.52	0.58
1:A:97:ARG:NH2	6:A:520:BHR:H14	2.12	0.58
1:B:10:TRP:HE1	1:B:26:GLN:NE2	2.03	0.57
1:B:354:LYS:HE3	1:B:358:GLU:OE1	2.04	0.56
1:A:171:LYS:HG3	1:A:175:TYR:CE1	2.41	0.56
1:A:425:LEU:HA	4:A:516:GOL:H31	1.86	0.55
1:A:211:THR:CG2	4:A:525:GOL:H32	2.36	0.55
6:A:520:BHR:O6	6:A:520:BHR:N8	2.40	0.54
1:A:429:PRO:HB2	9:A:571:HOH:O	2.08	0.53
1:B:19:PRO:HG3	1:B:142:ILE:HB	1.91	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:11:PRO:HD3	8:A:522:DTD:S1	2.50	0.52
1:A:211:THR:HG22	4:A:525:GOL:H32	1.90	0.52
1:A:10:TRP:HE1	1:A:26:GLN:NE2	2.06	0.52
1:A:286:THR:HG22	4:A:527:GOL:H11	1.92	0.52
1:B:446:GLN:HG2	9:B:612:HOH:O	2.10	0.51
1:A:23:THR:HG22	6:A:520:BHR:H16	1.91	0.51
6:A:520:BHR:O18	6:A:520:BHR:N11	2.45	0.50
1:B:257:LYS:HE2	9:B:705:HOH:O	2.11	0.49
1:A:424:GLY:O	4:A:516:GOL:H11	2.13	0.49
1:A:302:ASN:HD21	2:A:504:ACT:CH3	2.27	0.48
1:B:223:LEU:HB3	1:B:473:MET:HE2	1.96	0.48
1:B:414:PRO:HA	1:B:419:PHE:CD1	2.48	0.48
1:B:102:GLU:HB3	1:B:126:TYR:OH	2.13	0.48
1:B:223:LEU:HB3	1:B:473:MET:CE	2.43	0.47
1:A:414:PRO:HA	1:A:419:PHE:CG	2.50	0.47
1:A:88:PHE:HB3	1:A:110:VAL:HG21	1.97	0.46
1:A:211:THR:HG22	4:A:525:GOL:C3	2.45	0.46
1:A:258:ALA:HA	1:A:261:ASN:OD1	2.15	0.46
1:A:457:ARG:HG2	4:A:526:GOL:H2	1.98	0.46
1:A:385:GLN:HB3	1:A:417:ALA:HB2	1.98	0.45
1:B:11:PRO:HD3	8:B:508:DTD:S4	2.56	0.45
1:B:493:PRO:HA	4:B:509:GOL:H12	1.99	0.44
1:A:302:ASN:HD21	2:A:504:ACT:H3	1.82	0.44
1:A:110:VAL:HG23	9:A:793:HOH:O	2.17	0.44
1:A:207:VAL:O	1:A:211:THR:HG23	2.17	0.44
1:B:5:GLU:HG2	1:B:193:LYS:HB3	1.99	0.44
1:B:296:PRO:HB3	1:B:302:ASN:HD22	1.82	0.44
1:B:246:ILE:HD13	1:B:472:MET:CE	2.47	0.44
1:A:19:PRO:HG3	1:A:142:ILE:HB	1.99	0.43
1:A:338:GLN:HA	1:A:339:PRO:HD3	1.84	0.43
1:B:207:VAL:HA	1:B:210:GLU:HG2	2.00	0.43
1:B:265:VAL:O	1:B:269:LEU:HG	2.18	0.43
1:B:321:LYS:NZ	9:B:766:HOH:O	2.51	0.43
1:A:251:LEU:HD11	1:A:360:ILE:HD13	2.01	0.43
1:A:489:ALA:HB3	9:A:783:HOH:O	2.17	0.43
1:B:7:THR:HG22	1:B:214:ILE:HG22	2.01	0.43
1:A:211:THR:HG22	4:A:525:GOL:C2	2.49	0.42
1:A:271:TYR:CZ	1:A:314:LYS:HD3	2.55	0.42
1:B:246:ILE:CG2	4:B:504:GOL:H12	2.49	0.42
1:B:246:ILE:HG21	4:B:504:GOL:H12	2.01	0.42
1:B:496:GLN:NE2	9:B:742:HOH:O	2.44	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:387:ASP:HB3	9:A:809:HOH:O	2.20	0.41
1:A:180:ARG:HG3	1:A:189:PRO:HD2	2.02	0.41
1:A:414:PRO:HA	1:A:419:PHE:CD1	2.54	0.41
1:A:401:PRO:HD3	1:A:488:ILE:HG12	2.03	0.41
1:B:40:TYR:CE1	1:B:401:PRO:HB3	2.56	0.41
1:B:100:TRP:HA	1:B:413:VAL:HG21	2.02	0.41
1:A:246:ILE:HD13	1:A:472:MET:HG2	2.03	0.41
1:A:201:ASP:HB3	1:A:204:THR:CG2	2.32	0.40
1:B:316:LYS:HG2	1:B:333:ARG:HH11	1.86	0.40
1:A:403:ASP:HA	1:A:404:PRO:HA	1.93	0.40
1:A:20:HIS:CE1	1:A:87:ASN:HD22	2.40	0.40

All (2) 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)
9:A:880:HOH:O	9:B:770:HOH:O[4_455]	1.80	0.40
1:A:387:ASP:OD2	1:B:460:ASP:OD2[3_545]	1.93	0.27

## 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	496/501 (99%)	483 (97%)	13 (3%)	0	100	100
1	B	494/501 (99%)	482 (98%)	11 (2%)	1 (0%)	47	30
All	All	990/1002 (99%)	965 (98%)	24 (2%)	1 (0%)	51	33

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	328	ALA

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

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	422/424 (100%)	413 (98%)	9 (2%)	53	36
1	B	421/424 (99%)	412 (98%)	9 (2%)	53	36
All	All	843/848 (99%)	825 (98%)	18 (2%)	53	36

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	110	VAL
1	A	127	TYR
1	A	188	LYS
1	A	204	THR
1	A	309	GLN
1	A	372	SER
1	A	373	LEU
1	A	439	LEU
1	A	442	HIS
1	B	50	LEU
1	B	96[A]	GLN
1	B	111	LYS
1	B	127	TYR
1	B	188	LYS
1	B	373	LEU
1	B	439	LEU
1	B	472	MET
1	B	495	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	26	GLN
1	A	87	ASN
1	A	131	GLN
1	A	197	ASN

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Mol	Chain	Res	Type
1	A	302	ASN
1	A	446	GLN
1	B	25	ASN
1	B	26	GLN
1	B	174	GLN
1	B	234	GLN
1	B	302	ASN
1	B	336	ASN
1	B	416	HIS
1	B	442	HIS
1	B	496	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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 36 ligands modelled in this entry, 7 are monoatomic - leaving 29 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	$\# Z  > 2$
4	GOL	A	526	-	5,5,5	0.31	0	5,5,5	0.48	0
4	GOL	A	511	-	5,5,5	0.43	0	5,5,5	0.58	0
2	ACT	A	507	-	3,3,3	0.80	0	3,3,3	1.29	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	SO4	A	509	-	4,4,4	0.08	0	6,6,6	0.20	0
6	BHR	B	506	7	30,30,30	0.69	0	40,40,40	1.55	7 (17%)
4	GOL	A	525	-	5,5,5	0.46	0	5,5,5	0.75	0
4	GOL	A	516	-	5,5,5	0.35	0	5,5,5	0.52	0
4	GOL	B	509	-	5,5,5	0.34	0	5,5,5	0.44	0
2	ACT	A	502	-	3,3,3	0.83	0	3,3,3	0.78	0
4	GOL	A	512	-	5,5,5	0.32	0	5,5,5	0.48	0
6	BHR	A	520	7	30,30,30	1.09	2 (6%)	40,40,40	1.24	6 (15%)
4	GOL	A	515	-	5,5,5	0.35	0	5,5,5	0.51	0
2	ACT	A	503	-	3,3,3	0.74	0	3,3,3	1.45	0
2	ACT	B	503	-	3,3,3	0.80	0	3,3,3	1.16	0
4	GOL	A	510	-	5,5,5	0.34	0	5,5,5	0.37	0
4	GOL	A	513	-	5,5,5	0.48	0	5,5,5	0.61	0
2	ACT	A	508	-	3,3,3	0.78	0	3,3,3	1.38	0
4	GOL	B	510	-	5,5,5	0.38	0	5,5,5	0.39	0
4	GOL	A	514	-	5,5,5	0.43	0	5,5,5	0.62	0
2	ACT	A	505	-	3,3,3	0.71	0	3,3,3	1.24	0
4	GOL	A	527	-	5,5,5	0.51	0	5,5,5	0.58	0
2	ACT	B	511	-	3,3,3	0.80	0	3,3,3	1.38	0
4	GOL	B	504	-	5,5,5	0.31	0	5,5,5	0.57	0
2	ACT	A	506	-	3,3,3	0.74	0	3,3,3	1.11	0
8	DTD	A	522	-	6,8,8	0.73	0	6,10,10	1.01	0
2	ACT	B	502	-	3,3,3	0.85	0	3,3,3	1.32	0
8	DTD	B	508	-	6,8,8	1.07	1 (16%)	6,10,10	1.16	1 (16%)
2	ACT	B	512	-	3,3,3	0.78	0	3,3,3	1.25	0
2	ACT	A	504	-	3,3,3	0.82	0	3,3,3	1.28	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
4	GOL	A	526	-	-	2/4/4/4	-
4	GOL	A	511	-	-	2/4/4/4	-
4	GOL	A	510	-	-	2/4/4/4	-
4	GOL	A	513	-	-	4/4/4/4	-
4	GOL	B	504	-	-	0/4/4/4	-
4	GOL	A	527	-	-	2/4/4/4	-
4	GOL	B	509	-	-	2/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	GOL	B	510	-	-	4/4/4/4	-
8	DTD	A	522	-	-	-	0/0/1/1
4	GOL	A	514	-	-	2/4/4/4	-
4	GOL	A	512	-	-	2/4/4/4	-
4	GOL	A	525	-	-	4/4/4/4	-
6	BHR	A	520	7	-	7/21/21/21	0/2/2/2
6	BHR	B	506	7	-	1/21/21/21	0/2/2/2
4	GOL	A	515	-	-	2/4/4/4	-
8	DTD	B	508	-	-	-	0/0/1/1
4	GOL	A	516	-	-	4/4/4/4	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	520	BHR	C7-C1	2.59	1.55	1.51
8	B	508	DTD	C3-C2	2.46	1.55	1.52
6	A	520	BHR	C12-C13	2.10	1.55	1.51

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	506	BHR	C7-C1-C6	4.37	126.33	120.28
6	B	506	BHR	C12-C13-C18	4.36	124.80	120.45
6	B	506	BHR	C7-N8-C9	-3.22	104.50	111.29
6	B	506	BHR	C7-C1-C2	-2.72	114.74	120.11
6	A	520	BHR	C7-N8-C19	-2.69	106.26	112.02
6	A	520	BHR	C19-N8-C9	-2.69	105.41	111.94
6	B	506	BHR	C12-N11-C10	-2.40	106.22	111.29
6	A	520	BHR	C12-C13-C18	2.40	122.85	120.45
6	A	520	BHR	C17-C18-C13	2.35	123.25	120.41
8	B	508	DTD	O3-C3-C4	-2.32	105.92	109.91
6	B	506	BHR	C7-N8-C19	-2.21	107.29	112.02
6	A	520	BHR	C7-C1-C6	2.08	123.16	120.28
6	A	520	BHR	O20-C20-C19	-2.05	114.13	122.31
6	B	506	BHR	C19-N8-C9	-2.00	107.08	111.94

There are no chirality outliers.

All (40) torsion outliers are listed below:

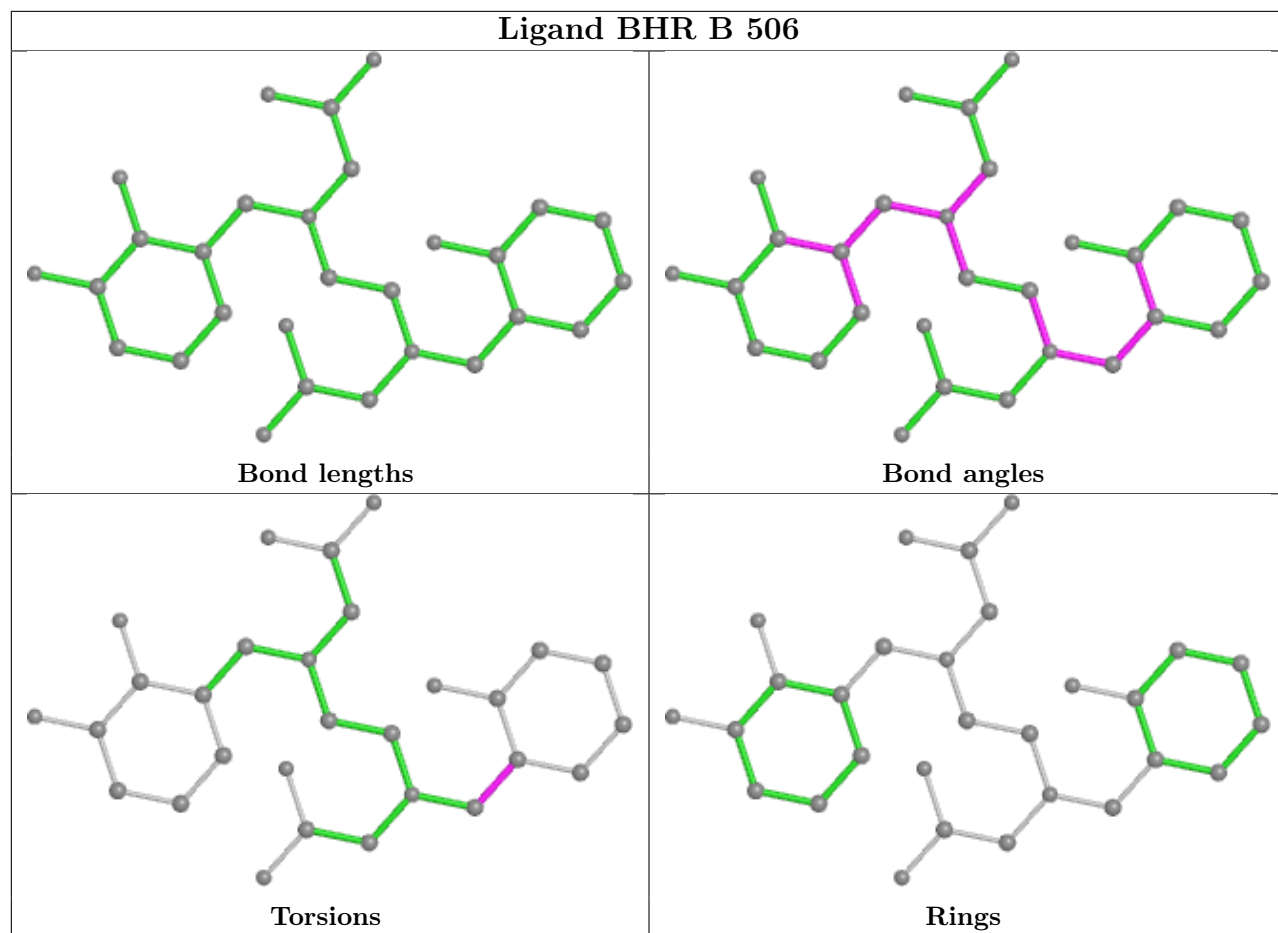
Mol	Chain	Res	Type	Atoms
4	A	511	GOL	C1-C2-C3-O3
4	A	512	GOL	C1-C2-C3-O3
4	A	514	GOL	C1-C2-C3-O3
4	A	515	GOL	O1-C1-C2-C3
4	A	525	GOL	C1-C2-C3-O3
4	A	527	GOL	O1-C1-C2-C3
4	B	510	GOL	C1-C2-C3-O3
6	A	520	BHR	C6-C1-C7-N8
6	A	520	BHR	C2-C1-C7-N8
4	A	513	GOL	O1-C1-C2-O2
4	A	516	GOL	O2-C2-C3-O3
4	A	510	GOL	C1-C2-C3-O3
4	A	513	GOL	O1-C1-C2-C3
4	A	513	GOL	C1-C2-C3-O3
4	A	516	GOL	C1-C2-C3-O3
4	A	525	GOL	O1-C1-C2-C3
4	A	526	GOL	O1-C1-C2-C3
4	B	509	GOL	C1-C2-C3-O3
4	B	510	GOL	O1-C1-C2-C3
4	A	512	GOL	O2-C2-C3-O3
4	A	514	GOL	O2-C2-C3-O3
4	A	515	GOL	O1-C1-C2-O2
4	A	526	GOL	O1-C1-C2-O2
4	A	527	GOL	O1-C1-C2-O2
4	B	510	GOL	O2-C2-C3-O3
6	A	520	BHR	N11-C12-C13-C18
4	A	511	GOL	O2-C2-C3-O3
4	B	510	GOL	O1-C1-C2-O2
4	A	525	GOL	O1-C1-C2-O2
4	A	525	GOL	O2-C2-C3-O3
4	A	513	GOL	O2-C2-C3-O3
4	B	509	GOL	O2-C2-C3-O3
6	A	520	BHR	C1-C7-N8-C19
4	A	516	GOL	O1-C1-C2-O2
6	A	520	BHR	C20-C19-N8-C9
6	A	520	BHR	N11-C12-C13-C14
6	A	520	BHR	C20-C19-N8-C7
4	A	516	GOL	O1-C1-C2-C3
4	A	510	GOL	O1-C1-C2-O2
6	B	506	BHR	N11-C12-C13-C18

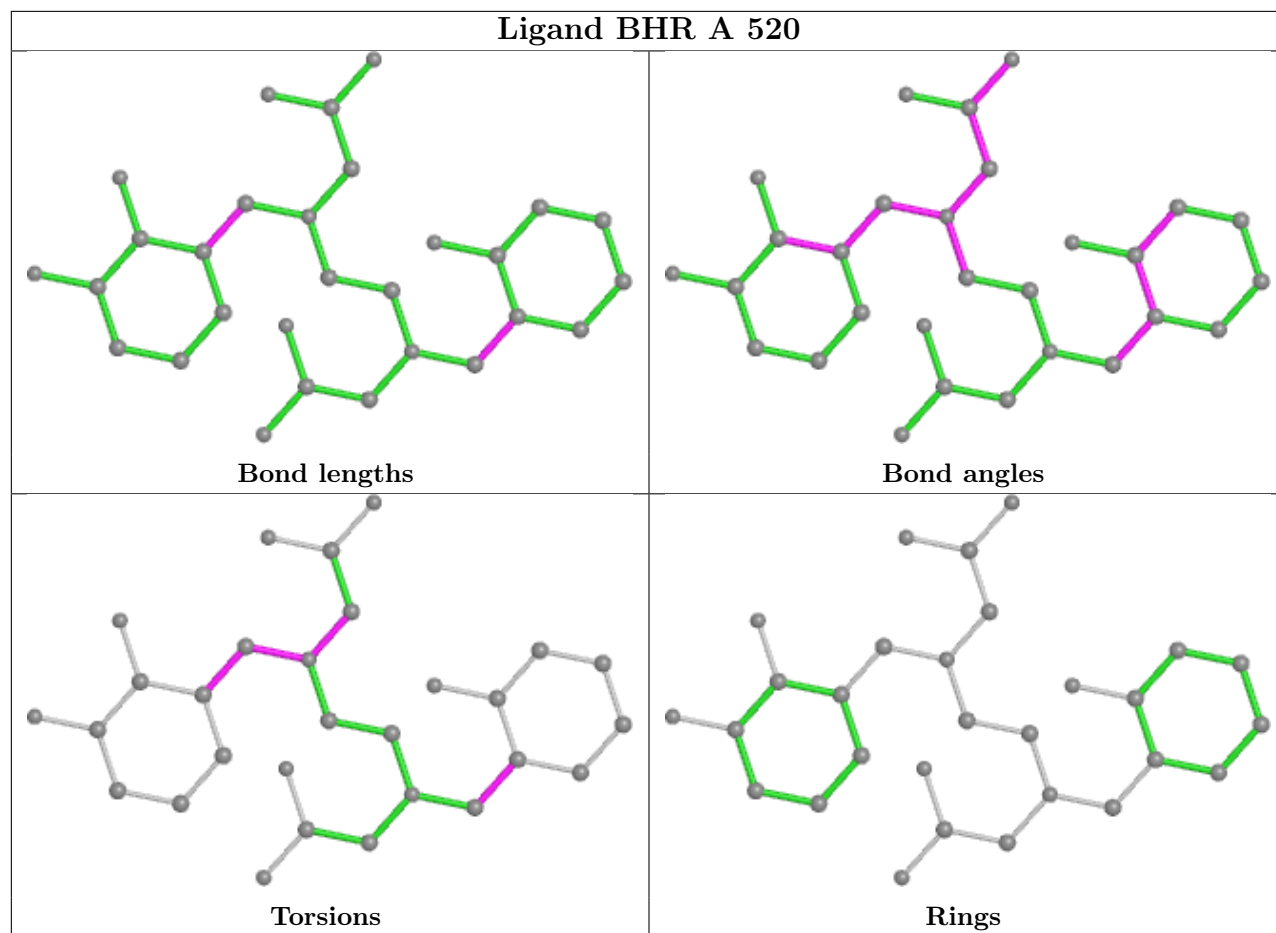
There are no ring outliers.

15 monomers are involved in 37 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	526	GOL	1	0
4	A	511	GOL	3	0
6	B	506	BHR	1	0
4	A	525	GOL	4	0
4	A	516	GOL	4	0
4	B	509	GOL	1	0
2	A	502	ACT	1	0
6	A	520	BHR	13	0
2	B	503	ACT	1	0
4	A	514	GOL	1	0
4	A	527	GOL	1	0
4	B	504	GOL	2	0
8	A	522	DTD	1	0
8	B	508	DTD	1	0
2	A	504	ACT	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	498/501 (99%)	-0.04	14 (2%) 53 57	11, 19, 31, 40	7 (1%)
1	B	496/501 (99%)	0.13	24 (4%) 30 34	11, 23, 43, 54	6 (1%)
All	All	994/1002 (99%)	0.05	38 (3%) 40 45	11, 21, 38, 54	13 (1%)

All (38) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	326	LEU	7.0
1	B	125	ALA	6.6
1	B	337	GLY	6.2
1	B	329	GLY	6.0
1	A	3	PRO	5.7
1	B	328	ALA	5.2
1	B	338	GLN	5.0
1	A	175	TYR	4.9
1	A	442	HIS	4.8
1	B	382	TYR	4.8
1	A	2	ALA	4.6
1	B	57	SER	4.6
1	A	172	LEU	4.4
1	B	58	GLU	4.4
1	B	113	LEU	4.2
1	B	327	PRO	4.1
1	B	108	VAL	4.0
1	B	331	ASP	3.8
1	B	60	GLY	3.8
1	B	336	ASN	3.3
1	A	329	GLY	3.2
1	A	382	TYR	3.2
1	B	330	LYS	3.2
1	B	442	HIS	3.1

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Mol	Chain	Res	Type	RSRZ
1	A	174	GLN	3.0
1	B	339	PRO	3.0
1	B	325	THR	2.9
1	B	59	ASP	2.8
1	A	58	GLU	2.7
1	A	498	LYS	2.6
1	B	499	PRO	2.6
1	B	61	LYS	2.5
1	A	441	THR	2.4
1	A	328	ALA	2.3
1	A	173	ASN	2.3
1	B	386	ARG	2.3
1	A	336	ASN	2.2
1	B	122	LEU	2.1

## 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(Å <sup>2</sup> )	Q<0.9
4	GOL	A	525	6/6	0.26	0.35	80,81,82,82	0
2	ACT	A	506	4/4	0.63	0.19	35,35,36,36	0
4	GOL	A	527	6/6	0.63	0.26	35,36,38,40	0
5	CL	A	519	1/1	0.67	0.19	86,86,86,86	0
2	ACT	A	502	4/4	0.69	0.26	28,30,31,31	0
4	GOL	B	509	6/6	0.70	0.23	35,39,41,42	0
4	GOL	A	513	6/6	0.71	0.20	33,35,35,35	0
4	GOL	A	526	6/6	0.72	0.26	39,41,41,43	0
2	ACT	A	507	4/4	0.73	0.18	62,62,62,62	0

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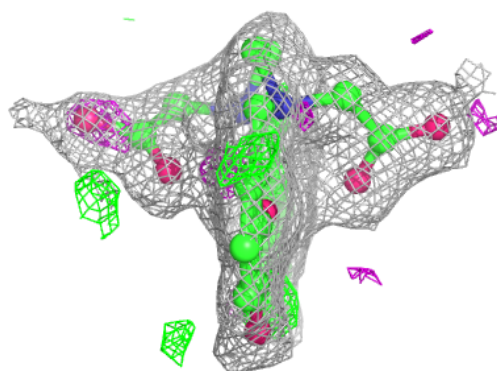
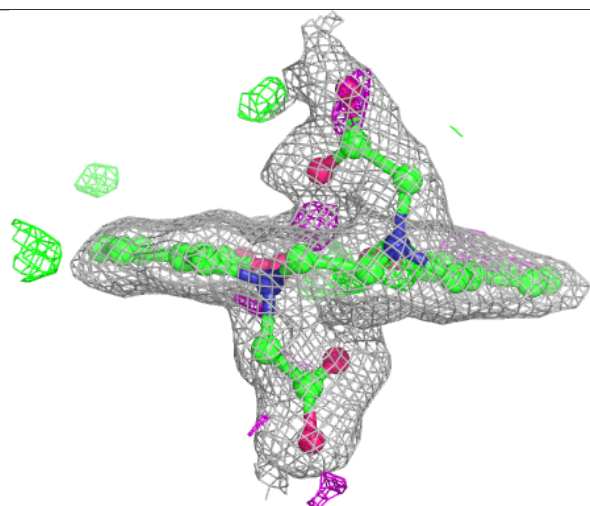
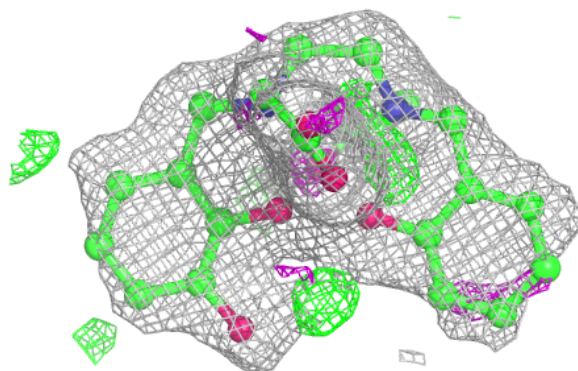
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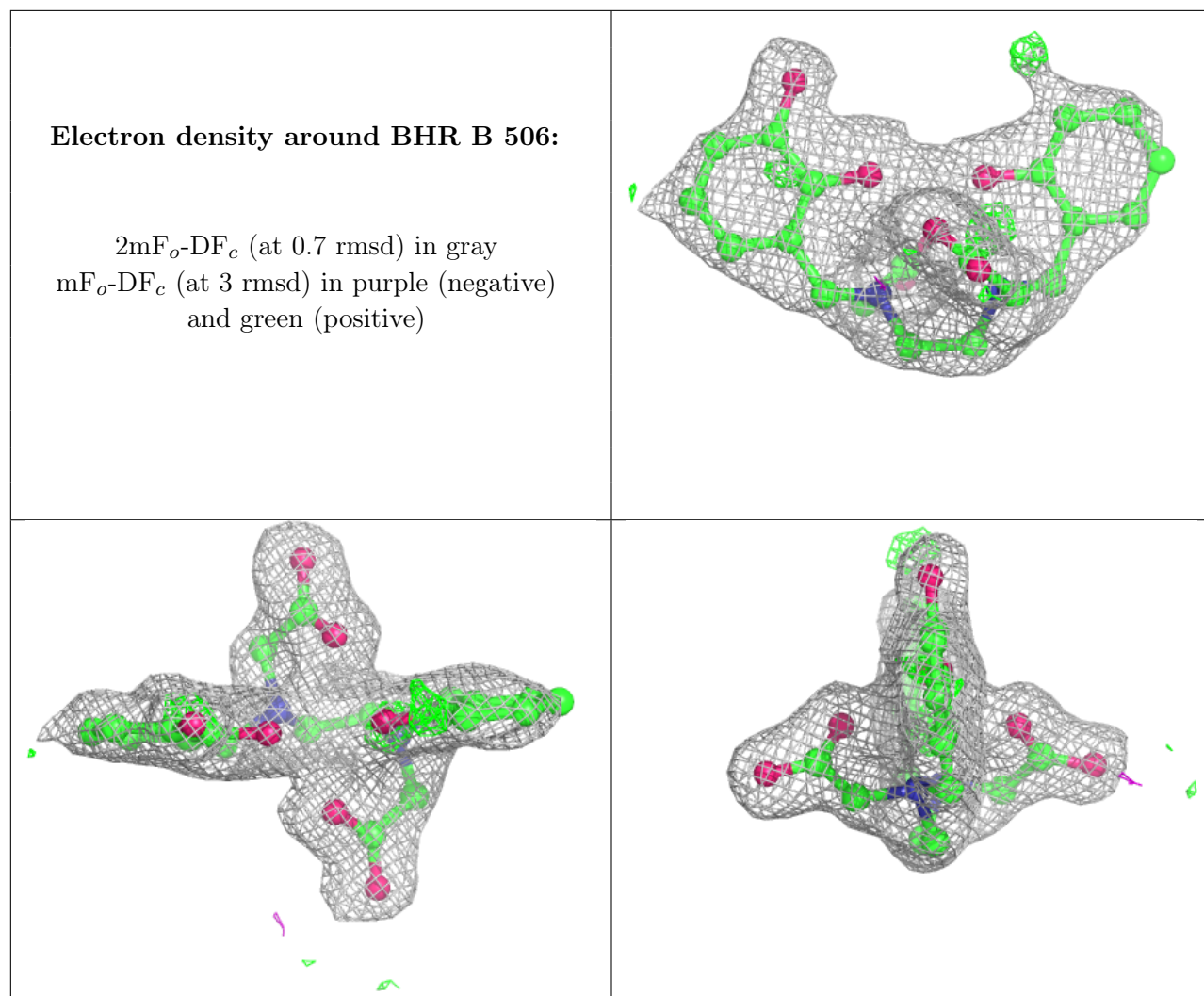
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
4	GOL	A	511	6/6	0.74	0.21	38,39,41,42	0
2	ACT	B	511	4/4	0.77	0.15	39,40,40,40	0
2	ACT	A	504	4/4	0.77	0.13	38,39,39,39	0
4	GOL	B	510	6/6	0.78	0.21	40,41,41,43	0
4	GOL	A	514	6/6	0.80	0.29	30,37,39,41	0
4	GOL	A	516	6/6	0.81	0.27	27,33,34,35	0
5	CL	A	517	1/1	0.83	0.12	64,64,64,64	0
2	ACT	B	512	4/4	0.84	0.17	38,38,39,39	0
4	GOL	B	504	6/6	0.84	0.16	32,37,39,39	0
4	GOL	A	515	6/6	0.85	0.23	35,39,40,43	0
2	ACT	B	503	4/4	0.85	0.16	43,44,44,44	0
2	ACT	A	503	4/4	0.86	0.22	59,59,59,59	0
4	GOL	A	512	6/6	0.86	0.15	37,39,40,42	0
5	CL	A	523	1/1	0.86	0.08	51,51,51,51	0
4	GOL	A	510	6/6	0.87	0.13	37,37,38,39	0
2	ACT	A	505	4/4	0.90	0.17	35,36,36,36	0
5	CL	A	518	1/1	0.92	0.18	48,48,48,48	0
2	ACT	A	508	4/4	0.93	0.19	40,40,41,41	0
2	ACT	B	502	4/4	0.93	0.14	38,38,38,38	0
6	BHR	A	520	29/29	0.93	0.15	18,31,34,37	0
8	DTD	A	522	8/8	0.93	0.12	23,25,26,28	0
6	BHR	B	506	29/29	0.94	0.12	15,29,32,32	0
5	CL	B	505	1/1	0.95	0.10	47,47,47,47	0
3	SO4	A	509	5/5	0.95	0.11	36,37,38,38	0
8	DTD	B	508	8/8	0.96	0.08	21,25,26,29	0
7	FE	A	521	1/1	0.97	0.05	19,19,19,19	1
7	FE	B	507	1/1	0.99	0.06	19,19,19,19	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 BHR A 520:**

$2mF_o-DF_c$  (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.