



# Full wwPDB X-ray Structure Validation Report ⓘ

May 26, 2020 – 10:19 am BST

PDB ID : 4B12  
Title : Plasmodium vivax N-myristoyltransferase with a bound benzofuran inhibitor (compound 23)  
Authors : Yu, Z.; Brannigan, J.A.; Moss, D.K.; Brzozowski, A.M.; Wilkinson, A.J.; Holder, A.A.; Tate, E.W.; Leatherbarrow, R.J.  
Deposited on : 2012-07-06  
Resolution : 1.79 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.

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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 : 2.11  
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) : 2.11

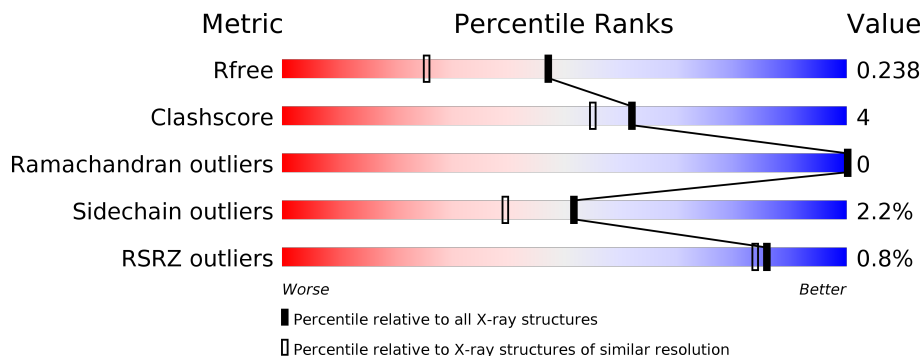
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.79 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	5950 (1.80-1.80)
Clashscore	141614	6793 (1.80-1.80)
Ramachandran outliers	138981	6697 (1.80-1.80)
Sidechain outliers	138945	6696 (1.80-1.80)
RSRZ outliers	127900	5850 (1.80-1.80)

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 on 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	385	 % 87% 11% •
1	B	385	 % 91% 8% •
1	C	385	 % 81% 14% ••

## 2 Entry composition i

There are 8 unique types of molecules in this entry. The entry contains 11137 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.

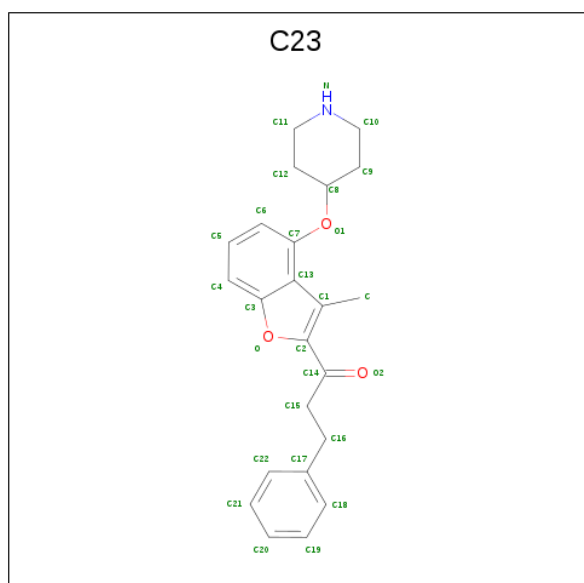
- Molecule 1 is a protein called GLYCYLPEPTIDE N-TETRADECANOYLTRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	385	Total 3299	C 2146	N 537	O 603	S 13	0	20	0
1	B	385	Total 3232	C 2101	N 525	O 593	S 13	0	9	0
1	C	368	Total 3162	C 2059	N 508	O 584	S 11	0	20	0

There are 3 discrepancies between the modelled and reference sequences:

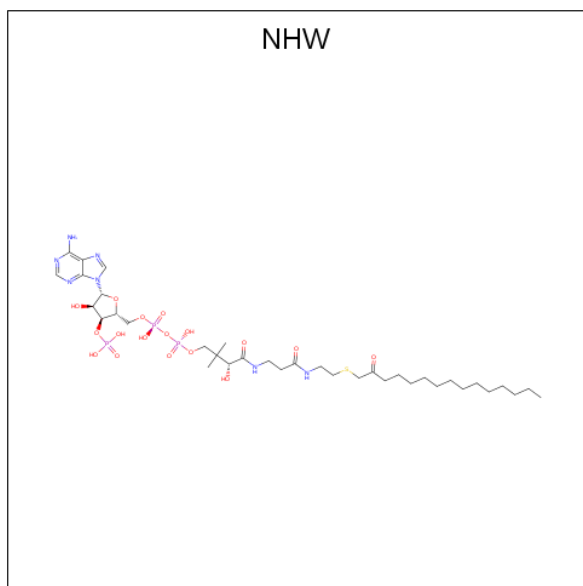
Chain	Residue	Modelled	Actual	Comment	Reference
A	26	MET	-	expression tag	UNP A5K1A2
B	26	MET	-	expression tag	UNP A5K1A2
C	26	MET	-	expression tag	UNP A5K1A2

- Molecule 2 is 1-[3-methyl-4-(piperidin-4-yloxy)-1-benzofuran-2-yl]-3-phenylpropan-1-one (three-letter code: C23) (formula: C<sub>23</sub>H<sub>25</sub>NO<sub>3</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	27	23	1	3	0	0
2	B	1	27	23	1	3	0	0
2	C	1	27	23	1	3	0	0

- Molecule 3 is 2-oxopentadecyl-CoA (three-letter code: NHW) (formula:  $C_{36}H_{64}N_7O_{17}P_3S$ ).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	N	O	P	S		
3	A	1	64	36	7	17	3	1	0	0
3	B	1	64	36	7	17	3	1	0	0
3	C	1	64	36	7	17	3	1	0	0

- Molecule 4 is DIMETHYL SULFOXIDE (three-letter code: DMS) (formula:  $C_2H_6OS$ ).



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

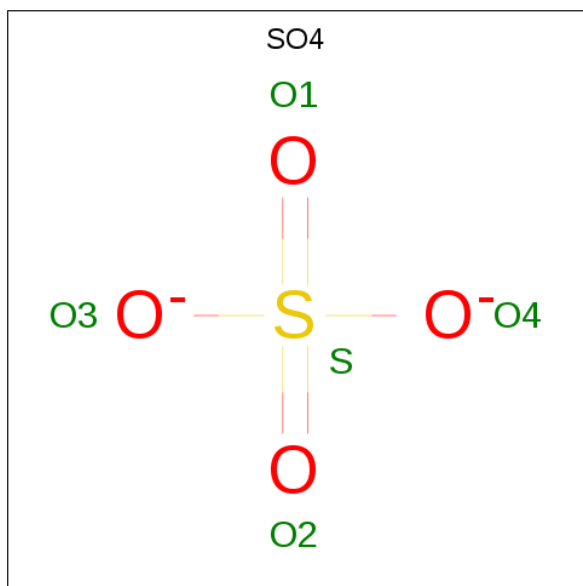
- Molecule 5 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

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

- Molecule 6 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	B	1	Total Mg 1 1	0	0
6	A	1	Total Mg 1 1	0	0
6	C	1	Total Mg 1 1	0	0

- Molecule 7 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	B	1	Total O S 5 4 1	0	0

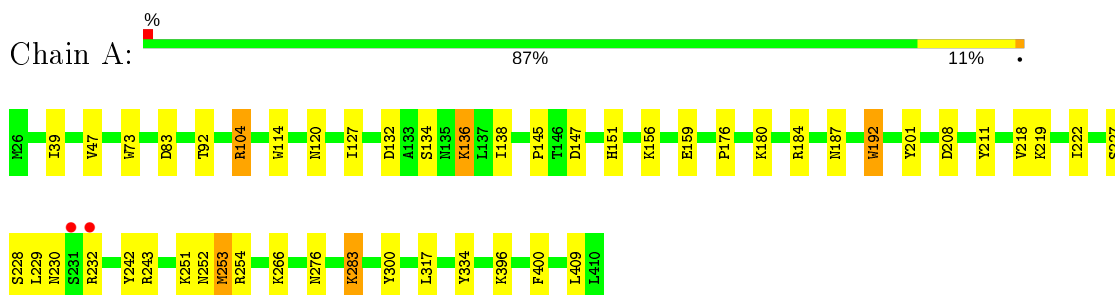
- Molecule 8 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	439	Total O 439 439	0	0
8	B	378	Total O 378 378	0	0
8	C	311	Total O 311 311	0	0

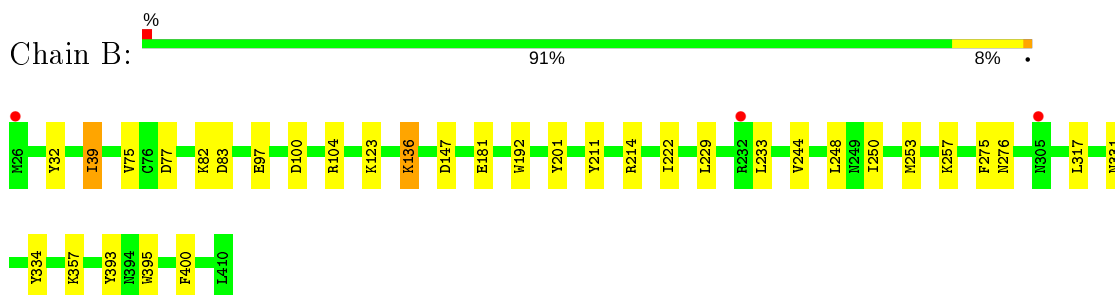
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA 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.

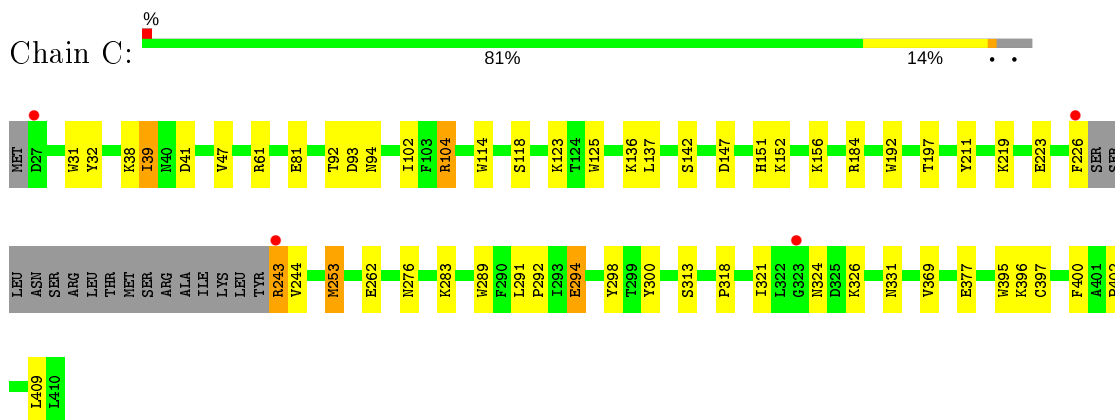
- Molecule 1: GLYCYLPEPTIDE N-TETRADECANOYLTRANSFERASE



- Molecule 1: GLYCYLPEPTIDE N-TETRADECANOYLTRANSFERASE



- Molecule 1: GLYCYLPEPTIDE N-TETRADECANOYLTRANSFERASE



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	57.47Å 121.92Å 178.25Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	54.76 – 1.79 54.70 – 1.79	Depositor EDS
% Data completeness (in resolution range)	99.9 (54.76-1.79) 100.0 (54.70-1.79)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.46 (at 1.80Å)	Xtrriage
Refinement program	REFMAC 5.7.0025	Depositor
R, $R_{free}$	0.185 , 0.239 0.185 , 0.238	Depositor DCC
$R_{free}$ test set	5949 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	15.4	Xtrriage
Anisotropy	0.287	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 42.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.45$ , $\langle L^2 \rangle = 0.28$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	11137	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	17.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.35% 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: C23, MG, CL, NHW, DMS, SO4

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	A	1.12	3/3424 (0.1%)	1.06	8/4633 (0.2%)
1	B	1.14	5/3336 (0.1%)	1.03	1/4516 (0.0%)
1	C	1.06	4/3292 (0.1%)	0.97	9/4457 (0.2%)
All	All	1.11	12/10052 (0.1%)	1.02	18/13606 (0.1%)

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	393	TYR	CG-CD1	7.06	1.48	1.39
1	B	192	TRP	CD2-CE2	7.01	1.49	1.41
1	C	31	TRP	CD2-CE2	6.03	1.48	1.41
1	C	395	TRP	CD2-CE2	5.89	1.48	1.41
1	B	181	GLU	CD-OE2	5.81	1.32	1.25
1	A	114	TRP	CD2-CE2	5.67	1.48	1.41
1	B	395	TRP	CD2-CE2	5.58	1.48	1.41
1	A	73	TRP	CD2-CE2	5.29	1.47	1.41
1	B	275	PHE	CG-CD1	5.24	1.46	1.38
1	A	192	TRP	CD2-CE2	5.18	1.47	1.41
1	C	192	TRP	CD2-CE2	5.13	1.47	1.41
1	C	114	TRP	CD2-CE2	5.07	1.47	1.41

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	184	ARG	NE-CZ-NH1	7.09	123.84	120.30
1	C	184	ARG	NE-CZ-NH2	-6.82	116.89	120.30
1	A	104	ARG	NE-CZ-NH2	-6.81	116.90	120.30
1	C	243	ARG	NE-CZ-NH2	-6.57	117.02	120.30
1	A	83	ASP	CB-CG-OD2	-6.40	112.54	118.30
1	C	61	ARG	NE-CZ-NH2	-5.99	117.30	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	104	ARG	NE-CZ-NH2	-5.98	117.31	120.30
1	A	208	ASP	CB-CG-OD1	5.77	123.49	118.30
1	C	409	LEU	CA-CB-CG	5.68	128.37	115.30
1	C	137	LEU	CB-CG-CD1	5.59	120.51	111.00
1	C	104	ARG	NE-CZ-NH1	5.51	123.06	120.30
1	C	253[A]	MET	CG-SD-CE	5.35	108.76	100.20
1	C	253[B]	MET	CG-SD-CE	5.35	108.76	100.20
1	A	409	LEU	CB-CG-CD1	-5.32	101.96	111.00
1	A	254	ARG	NE-CZ-NH1	-5.21	117.69	120.30
1	A	132	ASP	CB-CG-OD1	5.20	122.98	118.30
1	A	243	ARG	NE-CZ-NH1	5.18	122.89	120.30
1	B	83	ASP	CB-CG-OD1	5.00	122.80	118.30

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	3299	0	3323	34	0
1	B	3232	0	3233	20	0
1	C	3162	0	3155	29	0
2	A	27	0	25	0	0
2	B	27	0	25	4	0
2	C	27	0	25	2	0
3	A	64	0	59	0	0
3	B	64	0	60	0	0
3	C	64	0	60	1	0
4	A	12	0	18	1	0
4	B	12	0	18	2	0
4	C	8	0	12	1	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
5	C	1	0	0	0	0
6	A	1	0	0	0	0
6	B	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	C	1	0	0	0	0
7	B	5	0	0	0	0
8	A	439	0	0	1	0
8	B	378	0	0	4	0
8	C	311	0	0	7	0
All	All	11137	0	10013	89	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 (89) 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:253[A]:MET:HE3	1:A:300:TYR:HB3	1.28	1.11
1:A:253[A]:MET:CE	1:A:300:TYR:HB3	1.87	1.05
1:C:262[B]:GLU:HG3	1:C:283:LYS:HE3	1.50	0.91
1:A:253[A]:MET:CE	1:A:300:TYR:CB	2.52	0.88
1:A:253[A]:MET:HE1	1:A:300:TYR:HB2	1.56	0.88
1:A:253[A]:MET:HE1	1:A:300:TYR:CB	2.05	0.86
1:B:75:VAL:HG12	1:B:123[B]:LYS:HE2	1.64	0.80
1:A:283:LYS:HD2	8:A:2358:HOH:O	1.81	0.80
1:A:251[B]:LYS:HB2	1:A:251[B]:LYS:NZ	1.99	0.77
1:A:230:ASN:OD1	1:A:232:ARG:HG2	1.87	0.74
1:A:39:ILE:HD12	1:A:201:TYR:HE1	1.52	0.73
1:C:276[A]:ASN:ND2	1:C:400:PHE:CE2	2.58	0.71
1:A:276[A]:ASN:ND2	1:A:400:PHE:CE1	2.60	0.69
1:C:226:PHE:HE2	4:C:1414:DMS:H12	1.58	0.69
1:A:147[B]:ASP:OD1	1:A:156[B]:LYS:HE2	1.95	0.67
1:B:82:LYS:HG2	8:B:2080:HOH:O	1.97	0.65
1:B:276[A]:ASN:ND2	1:B:400:PHE:CE2	2.64	0.65
1:A:251[B]:LYS:HB2	1:A:251[B]:LYS:HZ3	1.64	0.63
1:A:251[B]:LYS:NZ	1:A:251[B]:LYS:CB	2.64	0.60
1:B:331:ASN:HB3	4:B:1415:DMS:H23	1.83	0.60
1:C:276[A]:ASN:ND2	1:C:400:PHE:CD2	2.71	0.59
1:C:147:ASP:OD1	1:C:156:LYS:NZ	2.36	0.58
1:B:222:ILE:HD12	1:B:229:LEU:HG	1.86	0.57
1:B:244:VAL:HG21	1:B:357:LYS:HD3	1.85	0.57
1:C:262[B]:GLU:CG	1:C:283:LYS:HE3	2.31	0.57
1:A:145:PRO:HB2	1:A:156[A]:LYS:HE2	1.87	0.56
1:A:222[A]:ILE:HD13	1:A:227:SER:HB2	1.89	0.55
1:B:136:LYS:HE3	8:B:2187:HOH:O	2.08	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:39:ILE:HD11	1:B:201:TYR:HE1	1.73	0.54
1:B:39:ILE:HD11	1:B:201:TYR:CE1	2.42	0.54
1:C:123[A]:LYS:HG3	8:C:2117:HOH:O	2.08	0.53
1:C:294[B]:GLU:HG2	8:C:2244:HOH:O	2.08	0.53
1:B:32:TYR:OH	1:B:39:ILE:HB	2.08	0.53
1:C:151[B]:HIS:CD2	1:C:397:CYS:HB2	2.46	0.51
1:C:219:LYS:O	1:C:223:GLU:HG3	2.10	0.50
1:B:250:ILE:O	1:B:253[B]:MET:HG2	2.12	0.50
1:C:294[B]:GLU:CG	8:C:2244:HOH:O	2.59	0.50
1:A:138:ILE:C	1:A:138:ILE:HD12	2.32	0.50
1:C:92:THR:O	1:C:104:ARG:HD2	2.12	0.49
2:B:1411:C23:H8	8:B:2322:HOH:O	2.11	0.49
1:A:218[A]:VAL:HG21	1:A:242:TYR:HB2	1.94	0.49
2:C:1411:C23:H8	8:C:2252:HOH:O	2.11	0.49
1:C:38:LYS:N	1:C:41:ASP:OD2	2.38	0.48
1:A:317:LEU:HB3	1:A:334:TYR:CE1	2.48	0.48
1:B:77:ASP:HA	1:B:123[B]:LYS:HE3	1.96	0.48
1:B:244:VAL:CG2	1:B:357:LYS:HD3	2.43	0.47
1:A:222[B]:ILE:HD13	1:A:229:LEU:HD21	1.96	0.47
1:C:118:SER:HB3	1:C:289:TRP:CZ2	2.49	0.47
1:A:134:SER:OG	1:A:136:LYS:HB2	2.15	0.47
1:C:47:VAL:HG11	1:C:396:LYS:HD2	1.96	0.46
1:A:151[A]:HIS:HA	1:A:276[A]:ASN:OD1	2.15	0.46
1:A:218[A]:VAL:CG2	1:A:242:TYR:HB2	2.45	0.46
1:A:251[B]:LYS:HG3	1:A:252:ASN:OD1	2.16	0.45
1:C:197:THR:O	3:C:1412:NHW:HP	2.17	0.44
1:A:39:ILE:HD12	1:A:201:TYR:CE1	2.41	0.44
2:B:1411:C23:H19	4:B:1414:DMS:H21	1.99	0.44
1:C:136:LYS:HE2	1:C:136:LYS:HB3	1.86	0.44
1:C:47:VAL:CG1	1:C:396:LYS:HD2	2.48	0.44
1:A:176:PRO:O	1:A:180:LYS:HG3	2.18	0.44
1:C:253[A]:MET:HG3	1:C:300:TYR:HB3	1.99	0.44
1:A:187:ASN:HB3	1:A:192:TRP:CZ3	2.52	0.44
2:C:1411:C23:H111	8:C:2162:HOH:O	2.17	0.43
1:A:127:ILE:HG21	1:A:127:ILE:HD13	1.80	0.43
1:B:39:ILE:HA	1:B:39:ILE:HD12	1.64	0.43
1:A:92:THR:O	1:A:104:ARG:HD2	2.19	0.42
1:A:266[B]:LYS:HE2	1:A:266[B]:LYS:HB3	1.43	0.42
1:B:276[A]:ASN:ND2	1:B:400:PHE:CD2	2.87	0.42
1:C:377[A]:GLU:CD	8:C:2291:HOH:O	2.57	0.42
1:C:331[B]:ASN:ND2	8:C:2257:HOH:O	2.43	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:291:LEU:HA	1:C:292:PRO:HD3	1.91	0.42
1:C:298:TYR:O	1:C:313:SER:HA	2.19	0.42
1:C:93:ASP:HB2	1:C:94:ASN:ND2	2.35	0.42
1:C:151[B]:HIS:HD2	1:C:397:CYS:HB2	1.85	0.42
1:A:159:GLU:OE1	4:A:1413:DMS:O	2.38	0.41
1:B:317:LEU:HB3	1:B:334:TYR:CE1	2.55	0.41
1:C:321:ILE:HG22	1:C:324:ASN:HB3	2.01	0.41
1:C:32[B]:TYR:OH	1:C:39:ILE:HB	2.20	0.41
2:B:1411:C23:H8	2:B:1411:C23:H6	1.95	0.41
1:B:97:GLU:HG2	1:B:104:ARG:HB2	2.02	0.41
1:C:125:TRP:O	1:C:142:SER:HA	2.21	0.41
1:A:47:VAL:CG1	1:A:396:LYS:HG2	2.52	0.40
1:C:369:VAL:HA	1:C:402:PRO:O	2.21	0.40
1:B:244:VAL:HG21	1:B:357:LYS:CD	2.50	0.40
1:A:253[A]:MET:HE2	1:A:253[A]:MET:HB3	1.41	0.40
1:B:233:LEU:HD12	1:B:233:LEU:HA	1.96	0.40
1:B:248:LEU:HD13	1:B:253[B]:MET:HB2	2.02	0.40
2:B:1411:C23:H6	8:B:2322:HOH:O	2.22	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	403/385 (105%)	394 (98%)	9 (2%)	0	100	100
1	B	392/385 (102%)	380 (97%)	12 (3%)	0	100	100
1	C	384/385 (100%)	370 (96%)	14 (4%)	0	100	100
All	All	1179/1155 (102%)	1144 (97%)	35 (3%)	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	A	371/351 (106%)	364 (98%)	7 (2%)	57	46
1	B	360/351 (103%)	352 (98%)	8 (2%)	52	39
1	C	355/351 (101%)	343 (97%)	12 (3%)	37	22
All	All	1086/1053 (103%)	1059 (98%)	27 (2%)	52	34

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	136	LYS
1	A	211	TYR
1	A	219	LYS
1	A	228	SER
1	A	253[A]	MET
1	A	253[B]	MET
1	A	283	LYS
1	B	39	ILE
1	B	100	ASP
1	B	136	LYS
1	B	147[A]	ASP
1	B	147[B]	ASP
1	B	211	TYR
1	B	214	ARG
1	B	257	LYS
1	C	39	ILE
1	C	81[A]	GLU
1	C	81[B]	GLU
1	C	102	ILE
1	C	152	LYS
1	C	211	TYR
1	C	243	ARG
1	C	244	VAL
1	C	294[A]	GLU
1	C	294[B]	GLU
1	C	318	PRO

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Mol	Chain	Res	Type
1	C	326	LYS

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

Mol	Chain	Res	Type
1	A	34	GLN
1	A	106	ASN
1	A	249	ASN
1	A	295	ASN
1	A	350	GLN
1	B	34	GLN
1	B	106	ASN
1	B	295	ASN
1	C	34	GLN
1	C	106	ASN

### 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 carbohydrates in this entry.

### 5.6 Ligand geometry [i](#)

Of 21 ligands modelled in this entry, 6 are monoatomic - leaving 15 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	C23	C	1411	-	26,30,30	0.82	0	26,41,41	2.03	7 (26%)
2	C23	A	1411	-	26,30,30	1.04	0	26,41,41	1.66	5 (19%)
4	DMS	B	1415	-	3,3,3	0.51	0	3,3,3	0.80	0
4	DMS	A	1415	-	3,3,3	0.30	0	3,3,3	1.09	0
4	DMS	B	1414	-	3,3,3	0.28	0	3,3,3	1.13	0
4	DMS	B	1413	-	3,3,3	0.70	0	3,3,3	0.90	0
3	NHW	C	1412	6	58,66,66	2.53	25 (43%)	70,92,92	1.33	8 (11%)
3	NHW	A	1412	6	58,66,66	2.13	19 (32%)	70,92,92	1.27	6 (8%)
7	SO4	B	1416	-	4,4,4	0.35	0	6,6,6	1.80	3 (50%)
3	NHW	B	1412	6	58,66,66	1.98	21 (36%)	70,92,92	1.11	6 (8%)
4	DMS	C	1413	-	3,3,3	0.42	0	3,3,3	0.21	0
4	DMS	A	1414	-	3,3,3	0.24	0	3,3,3	1.42	1 (33%)
4	DMS	A	1413	-	3,3,3	0.32	0	3,3,3	0.93	0
4	DMS	C	1414	-	3,3,3	0.28	0	3,3,3	1.60	1 (33%)
2	C23	B	1411	-	26,30,30	1.23	2 (7%)	26,41,41	1.87	6 (23%)

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	C23	C	1411	-	-	0/9/21/21	0/4/4/4
2	C23	A	1411	-	-	2/9/21/21	0/4/4/4
3	NHW	C	1412	6	-	2/61/81/81	0/3/3/3
3	NHW	A	1412	6	-	2/61/81/81	0/3/3/3
3	NHW	B	1412	6	-	1/61/81/81	0/3/3/3
2	C23	B	1411	-	-	0/9/21/21	0/4/4/4

All (67) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	1412	NHW	P3X-O9A	-8.48	1.23	1.50
3	C	1412	NHW	P3X-O8A	-6.49	1.29	1.54
3	A	1412	NHW	P3X-O9A	-6.48	1.29	1.50
3	C	1412	NHW	P1A-O1A	-5.13	1.32	1.50
3	A	1412	NHW	P1A-O1A	-4.99	1.33	1.50
3	A	1412	NHW	P1A-O2A	-4.88	1.32	1.55
3	C	1412	NHW	P1A-O2A	-4.47	1.34	1.55

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1412	NHW	O4X-C1X	-4.38	1.35	1.41
3	B	1412	NHW	P1A-O1A	-4.29	1.35	1.50
3	C	1412	NHW	P3X-O7A	-4.08	1.39	1.54
3	C	1412	NHW	P2A-O5A	-3.97	1.36	1.50
3	C	1412	NHW	P3X-O3X	3.96	1.66	1.59
3	B	1412	NHW	P2A-O4A	-3.96	1.36	1.55
3	A	1412	NHW	P2A-O5A	-3.90	1.37	1.50
3	C	1412	NHW	P2A-O4A	-3.87	1.37	1.55
3	B	1412	NHW	P2A-O5A	-3.83	1.37	1.50
3	B	1412	NHW	P3X-O8A	-3.71	1.40	1.54
3	B	1412	NHW	P2A-O6A	-3.61	1.44	1.59
3	A	1412	NHW	P2A-O6A	-3.58	1.44	1.59
3	C	1412	NHW	C2A-N1A	-3.51	1.27	1.33
3	A	1412	NHW	O9-C9	-3.48	1.16	1.23
3	C	1412	NHW	O3X-C3X	-3.42	1.31	1.44
3	B	1412	NHW	P3X-O3X	3.40	1.65	1.59
3	A	1412	NHW	P2A-O4A	-3.40	1.39	1.55
3	B	1412	NHW	C2A-N1A	-3.34	1.27	1.33
3	A	1412	NHW	O2X-C2X	-3.33	1.35	1.43
3	C	1412	NHW	C4A-N3A	-3.27	1.31	1.35
3	B	1412	NHW	P1A-O2A	-3.25	1.40	1.55
3	B	1412	NHW	C4A-N3A	-3.22	1.31	1.35
3	B	1412	NHW	C5X-C4X	3.17	1.61	1.51
2	B	1411	C23	C1-C13	3.00	1.43	1.40
3	C	1412	NHW	P2A-O6A	-2.97	1.47	1.59
3	B	1412	NHW	C6-C5	2.93	1.56	1.51
3	B	1412	NHW	P3X-O7A	-2.86	1.43	1.54
3	A	1412	NHW	C5X-C4X	2.84	1.60	1.51
3	A	1412	NHW	C13-C11	-2.83	1.47	1.53
3	C	1412	NHW	O5X-C5X	-2.79	1.34	1.44
3	B	1412	NHW	CP-S1	2.78	1.88	1.81
3	C	1412	NHW	C13-C11	-2.77	1.47	1.53
3	C	1412	NHW	P1A-O5X	-2.73	1.48	1.59
3	C	1412	NHW	C5A-N7A	-2.59	1.30	1.39
3	B	1412	NHW	P1A-O5X	-2.58	1.48	1.59
3	C	1412	NHW	O5-C5	-2.53	1.18	1.23
3	A	1412	NHW	O5-C5	-2.49	1.18	1.23
3	C	1412	NHW	O4X-C1X	-2.45	1.37	1.41
3	A	1412	NHW	O5X-C5X	-2.44	1.35	1.44
3	B	1412	NHW	C3-N4	-2.43	1.40	1.46
3	C	1412	NHW	CP-C1M	2.41	1.55	1.51
3	C	1412	NHW	O4X-C4X	-2.40	1.39	1.45

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	1412	NHW	O4X-C1X	-2.38	1.37	1.41
3	C	1412	NHW	C2A-N3A	-2.34	1.28	1.32
3	B	1412	NHW	C5A-N7A	-2.32	1.31	1.39
3	A	1412	NHW	C5A-N7A	-2.32	1.31	1.39
3	C	1412	NHW	O9-C9	-2.31	1.18	1.23
3	C	1412	NHW	C9-N8	-2.26	1.28	1.33
3	C	1412	NHW	O2X-C2X	-2.26	1.37	1.43
3	A	1412	NHW	P3X-O7A	-2.24	1.46	1.54
3	B	1412	NHW	O4X-C4X	-2.22	1.40	1.45
3	C	1412	NHW	C8A-N7A	-2.18	1.30	1.34
3	A	1412	NHW	C2A-N1A	-2.16	1.29	1.33
3	B	1412	NHW	C2A-N3A	-2.14	1.28	1.32
3	B	1412	NHW	O5X-C5X	-2.13	1.36	1.44
3	A	1412	NHW	C4A-N3A	-2.12	1.32	1.35
3	A	1412	NHW	C8A-N7A	-2.11	1.30	1.34
3	B	1412	NHW	O2X-C2X	-2.10	1.38	1.43
3	A	1412	NHW	O4X-C4X	-2.05	1.40	1.45
2	B	1411	C23	C5-C4	2.01	1.41	1.36

All (43) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	1412	NHW	O6A-C12-C11	5.56	119.48	110.55
2	C	1411	C23	C10-N-C11	5.25	125.43	110.34
2	A	1411	C23	C1-C13-C3	-5.25	101.48	110.65
2	C	1411	C23	C1-C13-C3	-5.04	101.83	110.65
2	B	1411	C23	C1-C13-C3	-4.51	102.76	110.65
2	B	1411	C23	C10-N-C11	4.31	122.72	110.34
3	C	1412	NHW	N3A-C2A-N1A	-4.23	122.06	128.68
3	B	1412	NHW	N3A-C2A-N1A	-4.02	122.39	128.68
3	A	1412	NHW	C4A-C5A-N7A	-3.96	105.27	109.40
2	B	1411	C23	O1-C8-C9	3.73	116.55	108.31
3	C	1412	NHW	C2-S1-CP	-3.72	95.49	101.71
3	B	1412	NHW	O6A-C12-C11	3.61	116.35	110.55
3	A	1412	NHW	O6A-C12-C11	3.37	115.96	110.55
2	C	1411	C23	C4-C3-C13	3.30	123.31	117.84
2	A	1411	C23	C10-N-C11	3.11	119.28	110.34
2	B	1411	C23	C9-C10-N	3.00	116.72	110.64
2	C	1411	C23	O1-C8-C12	2.91	114.74	108.31
3	B	1412	NHW	C7-C6-C5	-2.71	107.84	112.36
7	B	1416	SO4	O3-S-O1	-2.71	95.19	109.31
3	A	1412	NHW	O4X-C4X-C5X	-2.66	100.62	109.37

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1411	C23	C12-C11-N	2.62	115.94	110.64
2	B	1411	C23	C4-C3-C13	2.50	121.99	117.84
3	C	1412	NHW	C6-C5-N4	-2.46	112.29	116.42
3	B	1412	NHW	C10-C9-N8	-2.45	111.70	116.58
4	C	1414	DMS	O-S-C2	2.37	118.61	106.54
7	B	1416	SO4	O3-S-O2	2.36	121.61	109.31
2	B	1411	C23	O1-C8-C12	2.34	113.49	108.31
2	A	1411	C23	O1-C7-C6	-2.34	120.35	124.59
4	A	1414	DMS	O-S-C2	2.33	118.41	106.54
2	A	1411	C23	O1-C8-C9	2.28	113.35	108.31
7	B	1416	SO4	O4-S-O1	2.25	121.06	109.31
3	C	1412	NHW	O8A-P3X-O7A	2.23	116.16	107.64
3	C	1412	NHW	O5-C5-N4	2.22	127.20	123.01
3	C	1412	NHW	C4A-C5A-N7A	-2.20	107.11	109.40
3	B	1412	NHW	C4A-C5A-N7A	-2.19	107.12	109.40
3	B	1412	NHW	O5X-C5X-C4X	2.16	116.44	108.99
3	A	1412	NHW	N3A-C2A-N1A	-2.16	125.30	128.68
2	A	1411	C23	O2-C14-C2	-2.16	116.16	120.10
2	C	1411	C23	O2-C14-C2	-2.16	116.17	120.10
3	C	1412	NHW	O3X-P3X-O9A	-2.13	101.18	109.39
3	A	1412	NHW	O4X-C1X-C2X	-2.10	103.86	106.93
2	C	1411	C23	C5-C6-C7	2.02	122.99	119.89
3	A	1412	NHW	O5X-C5X-C4X	2.02	115.93	108.99

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1411	C23	C13-C7-O1-C8
2	A	1411	C23	C6-C7-O1-C8
3	C	1412	NHW	C12-O6A-P2A-O5A
3	B	1412	NHW	C6-C7-N8-C9
3	C	1412	NHW	C12-O6A-P2A-O4A
3	A	1412	NHW	C6-C7-N8-C9
3	A	1412	NHW	C7M-C8M-C9M-CAM

There are no ring outliers.

7 monomers are involved in 10 short contacts:

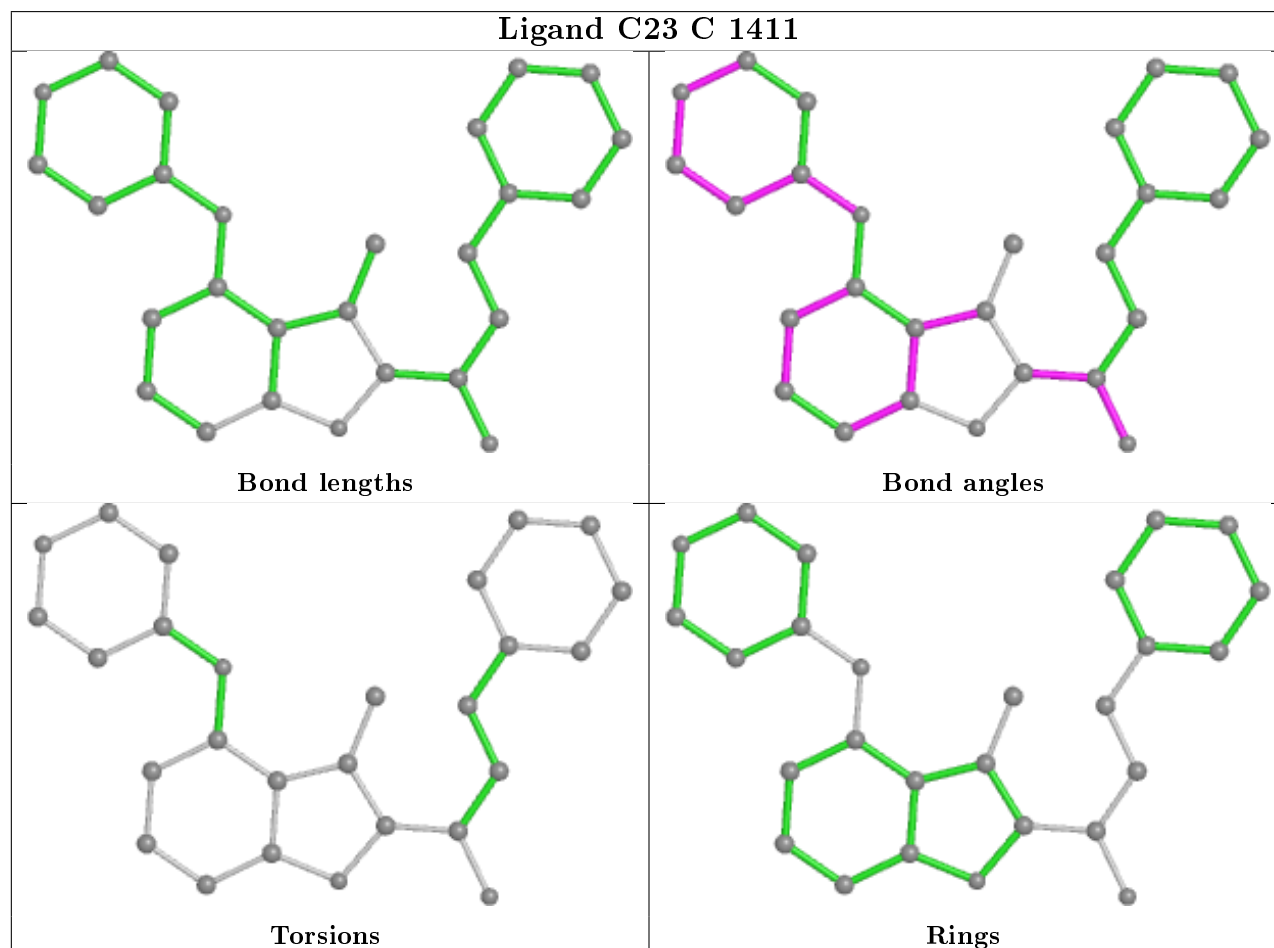
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	1411	C23	2	0

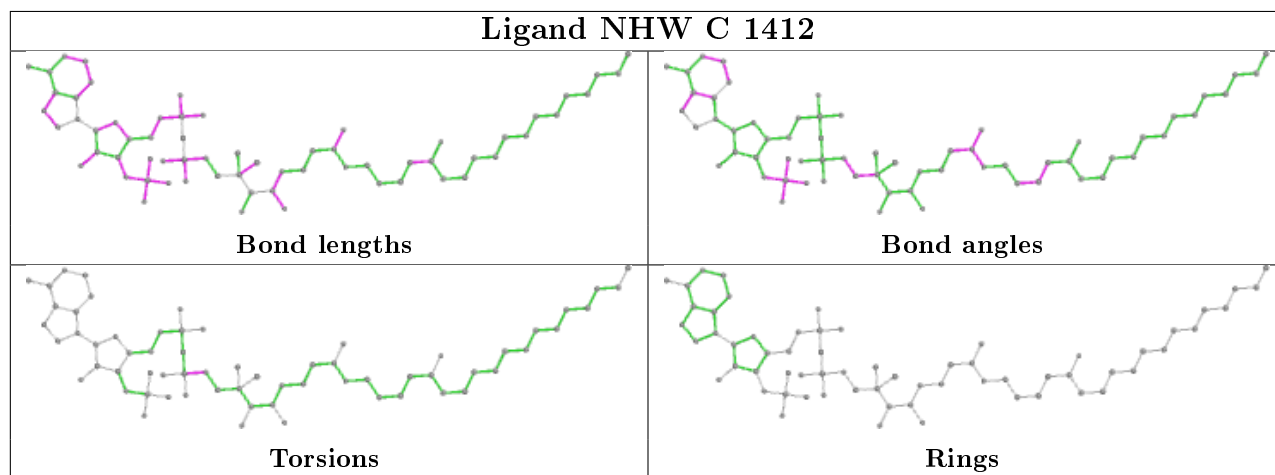
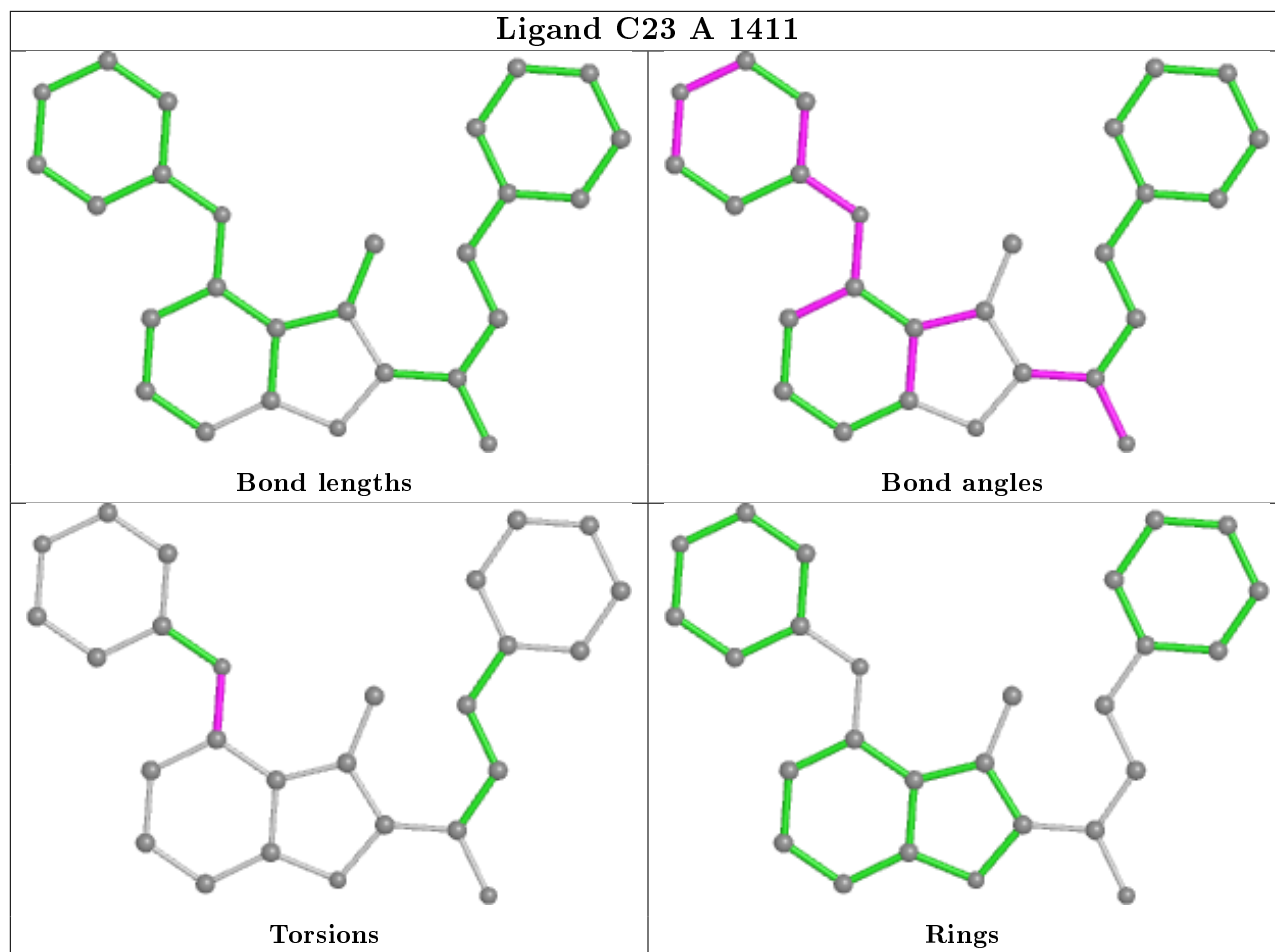
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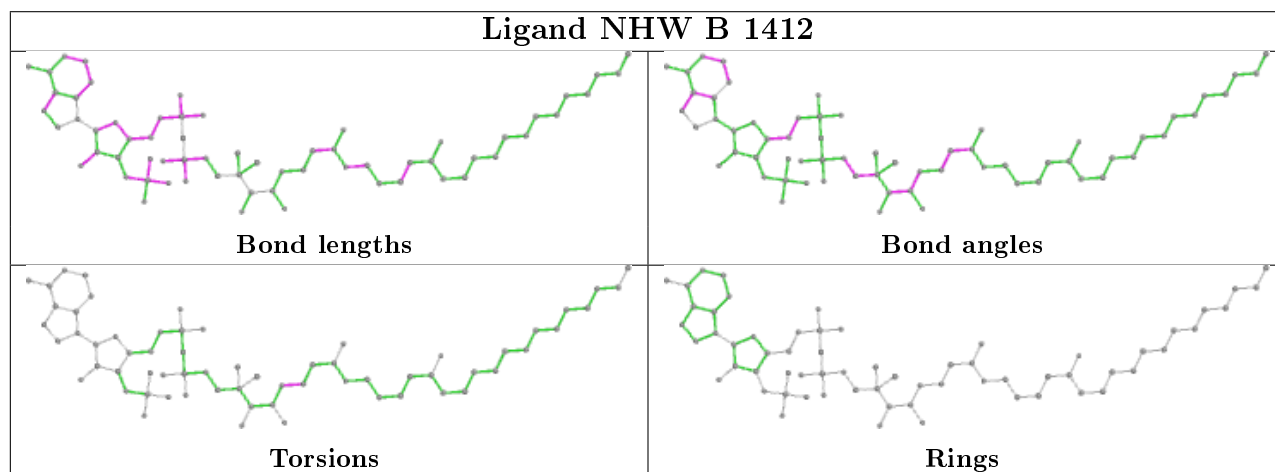
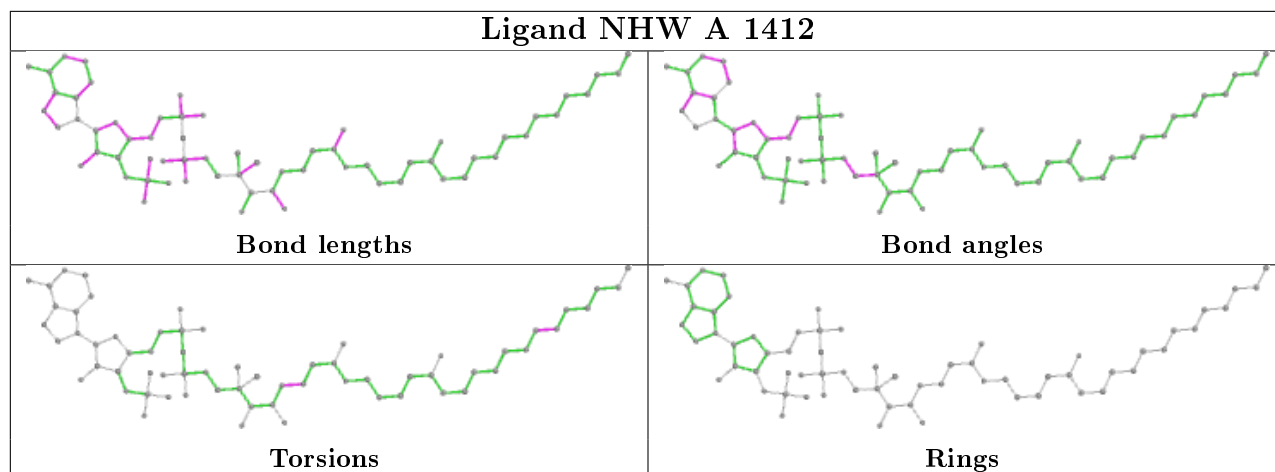
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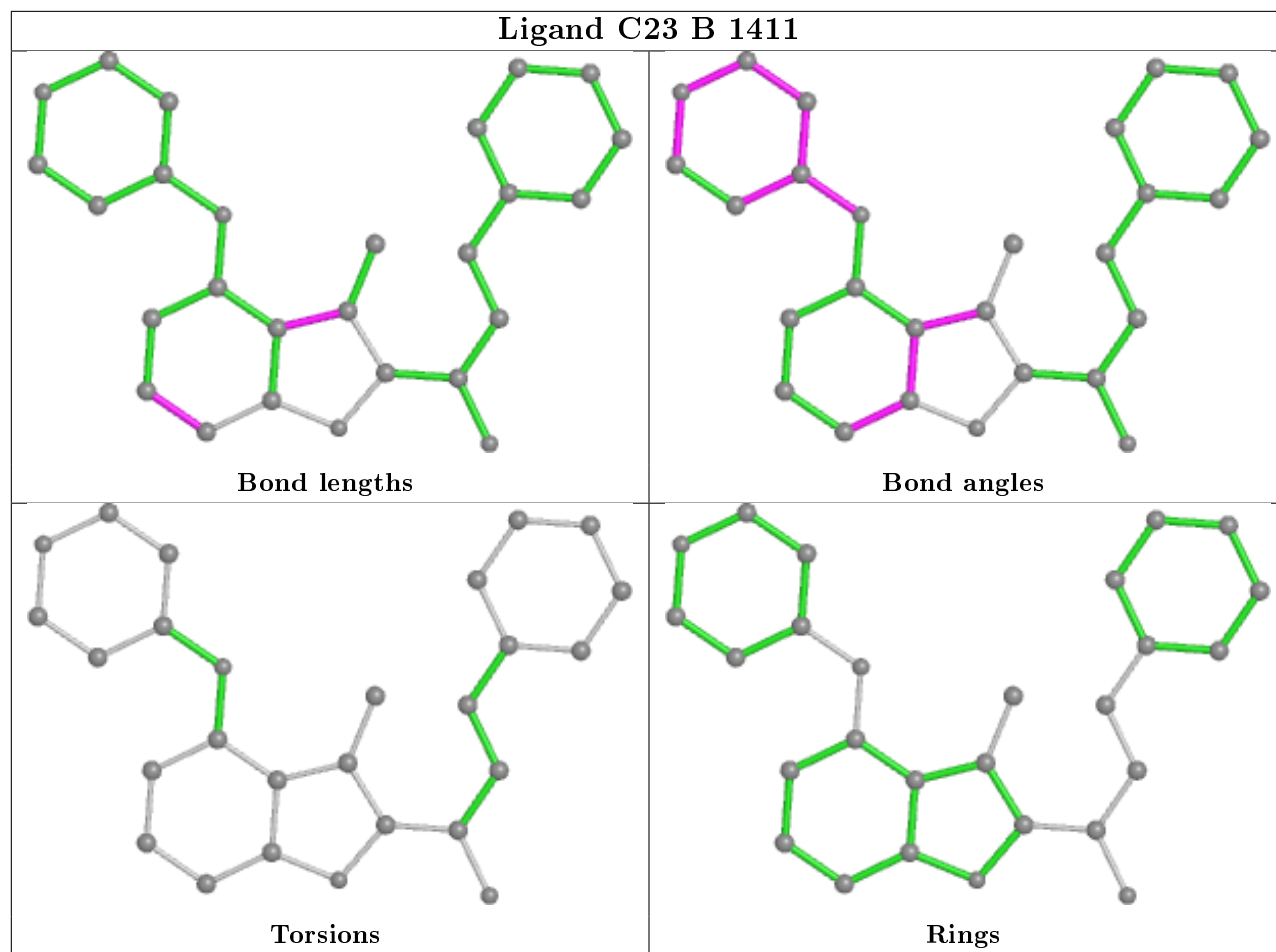
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	1415	DMS	1	0
4	B	1414	DMS	1	0
3	C	1412	NHW	1	0
4	A	1413	DMS	1	0
4	C	1414	DMS	1	0
2	B	1411	C23	4	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.









## 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	385/385 (100%)	-0.28	2 (0%) 91 89	9, 14, 27, 52	13 (3%)
1	B	385/385 (100%)	-0.26	3 (0%) 86 84	7, 13, 29, 57	13 (3%)
1	C	368/385 (95%)	-0.20	4 (1%) 80 78	9, 16, 33, 54	12 (3%)
All	All	1138/1155 (98%)	-0.24	9 (0%) 86 84	7, 14, 31, 57	38 (3%)

All (9) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	323	GLY	3.6
1	B	232	ARG	3.3
1	A	232	ARG	2.7
1	A	231	SER	2.3
1	B	26	MET	2.3
1	B	305	ASN	2.3
1	C	226	PHE	2.2
1	C	27	ASP	2.2
1	C	243	ARG	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 carbohydrates in this entry.

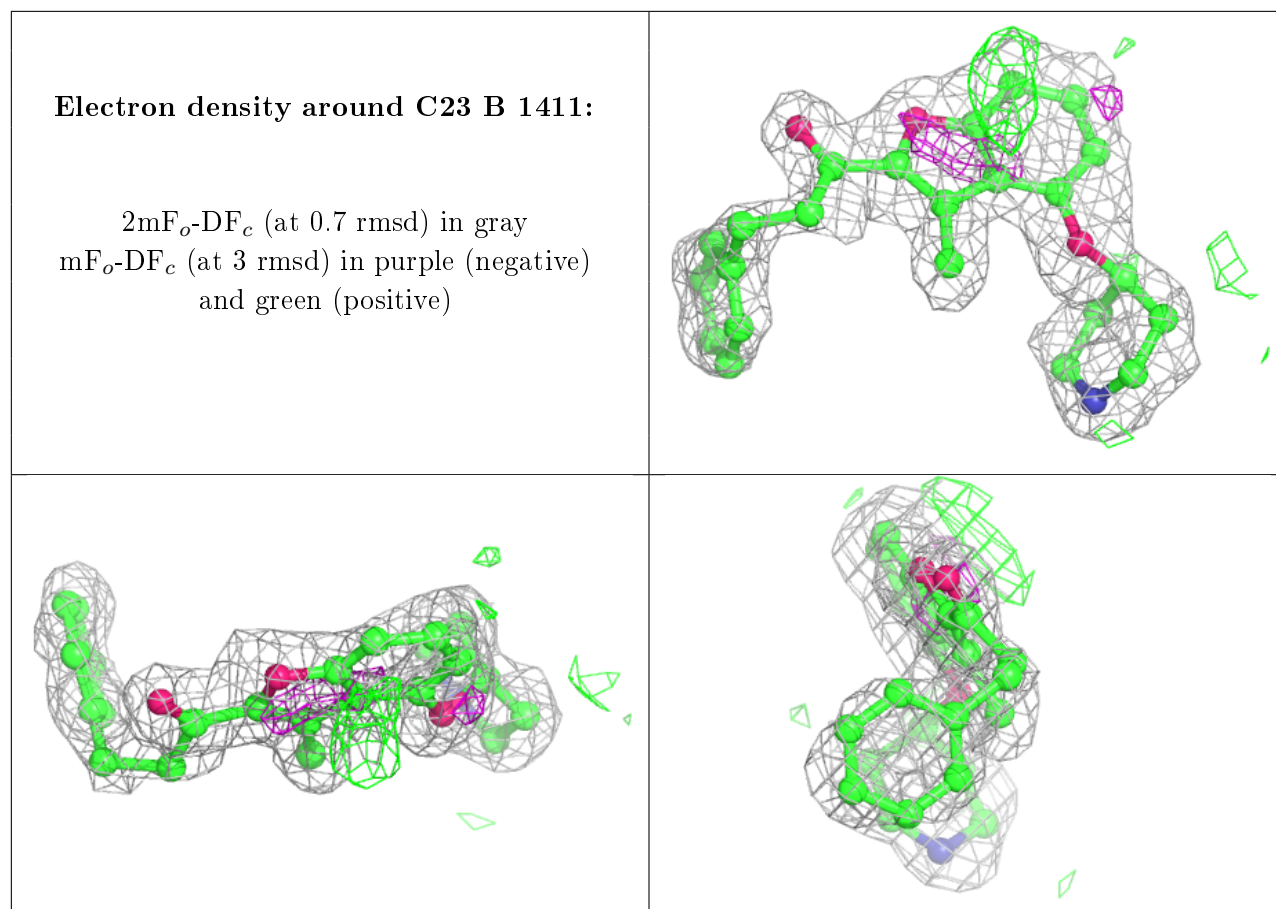


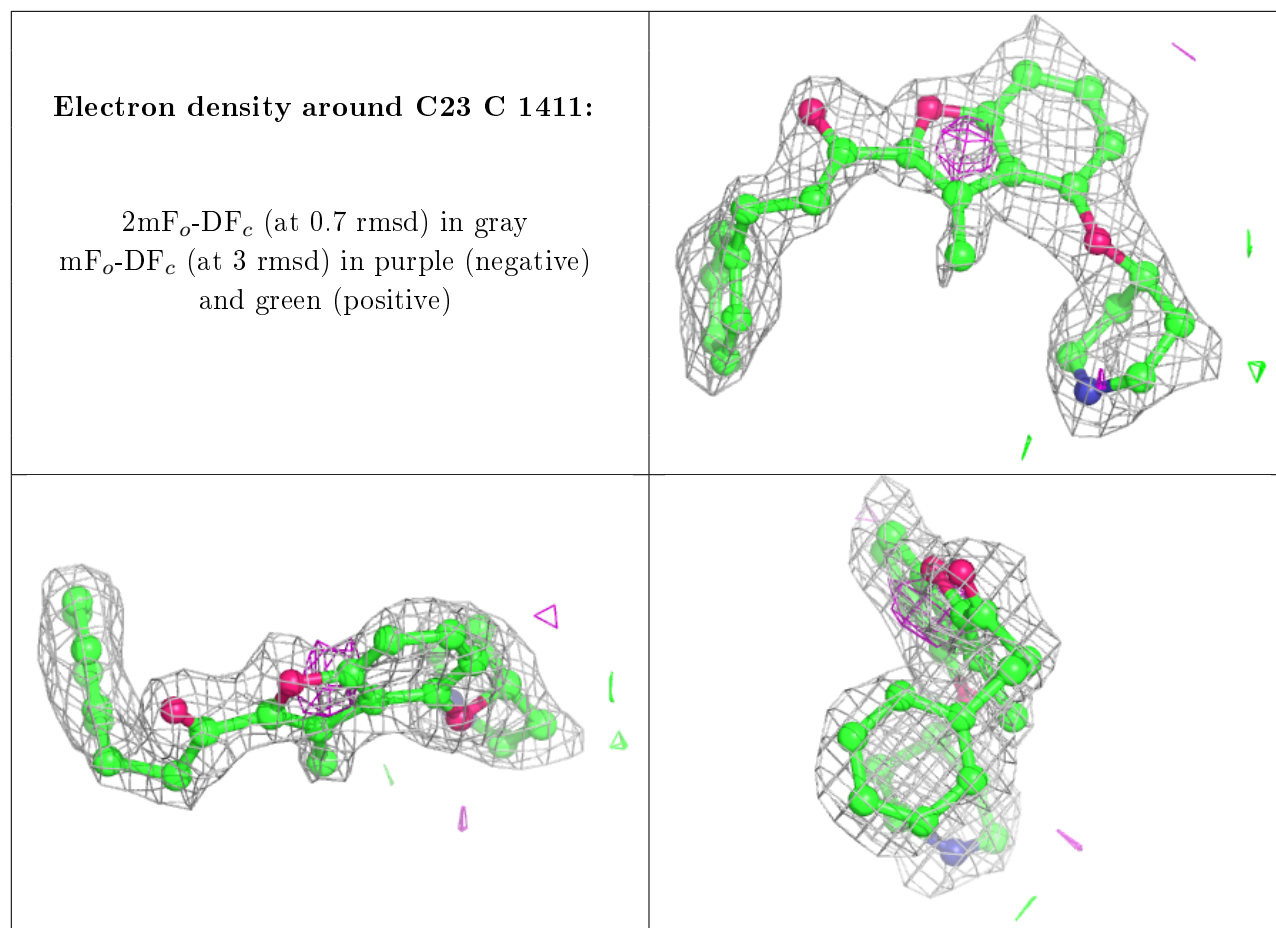
## 6.4 Ligands

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	DMS	A	1415	4/4	0.78	0.19	31,33,41,47	0
2	C23	B	1411	27/27	0.81	0.18	23,31,34,35	0
2	C23	C	1411	27/27	0.82	0.17	31,36,45,47	0
2	C23	A	1411	27/27	0.85	0.17	22,28,34,35	0
4	DMS	B	1413	4/4	0.89	0.15	27,29,32,39	0
7	SO4	B	1416	5/5	0.90	0.11	35,40,42,46	0
4	DMS	B	1415	4/4	0.92	0.14	43,43,45,48	0
4	DMS	C	1414	4/4	0.94	0.21	33,42,45,47	0
4	DMS	B	1414	4/4	0.94	0.21	30,36,37,46	0
4	DMS	C	1413	4/4	0.95	0.20	29,32,35,37	0
4	DMS	A	1413	4/4	0.96	0.13	28,30,33,34	0
3	NHW	A	1412	64/64	0.96	0.08	8,11,14,16	0
4	DMS	A	1414	4/4	0.96	0.19	26,30,32,35	0
3	NHW	B	1412	64/64	0.97	0.07	5,11,15,18	0
3	NHW	C	1412	64/64	0.97	0.07	9,13,17,21	0
6	MG	C	1416	1/1	0.97	0.08	28,28,28,28	0
5	CL	C	1415	1/1	0.99	0.04	13,13,13,13	0
6	MG	B	1418	1/1	0.99	0.06	23,23,23,23	0
5	CL	B	1417	1/1	0.99	0.07	11,11,11,11	0
6	MG	A	1417	1/1	0.99	0.08	21,21,21,21	0
5	CL	A	1416	1/1	0.99	0.03	13,13,13,13	0

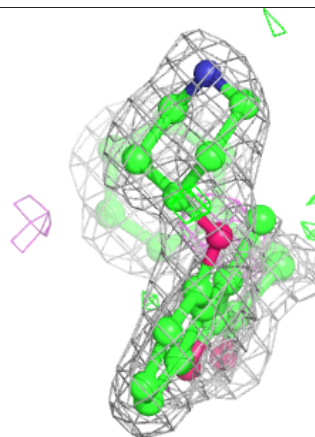
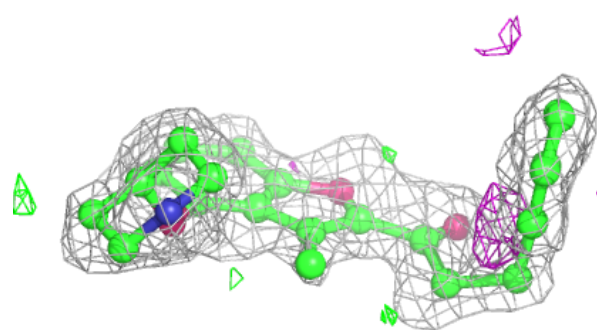
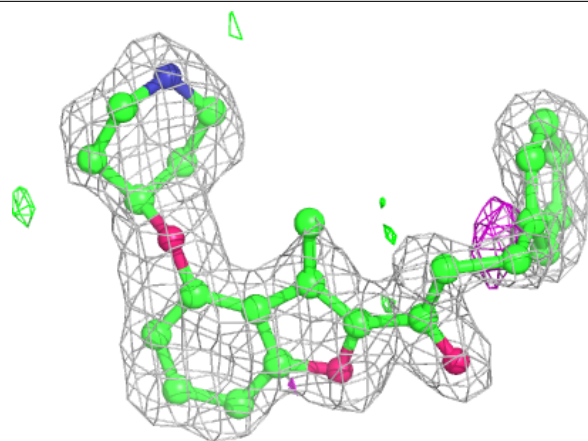
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

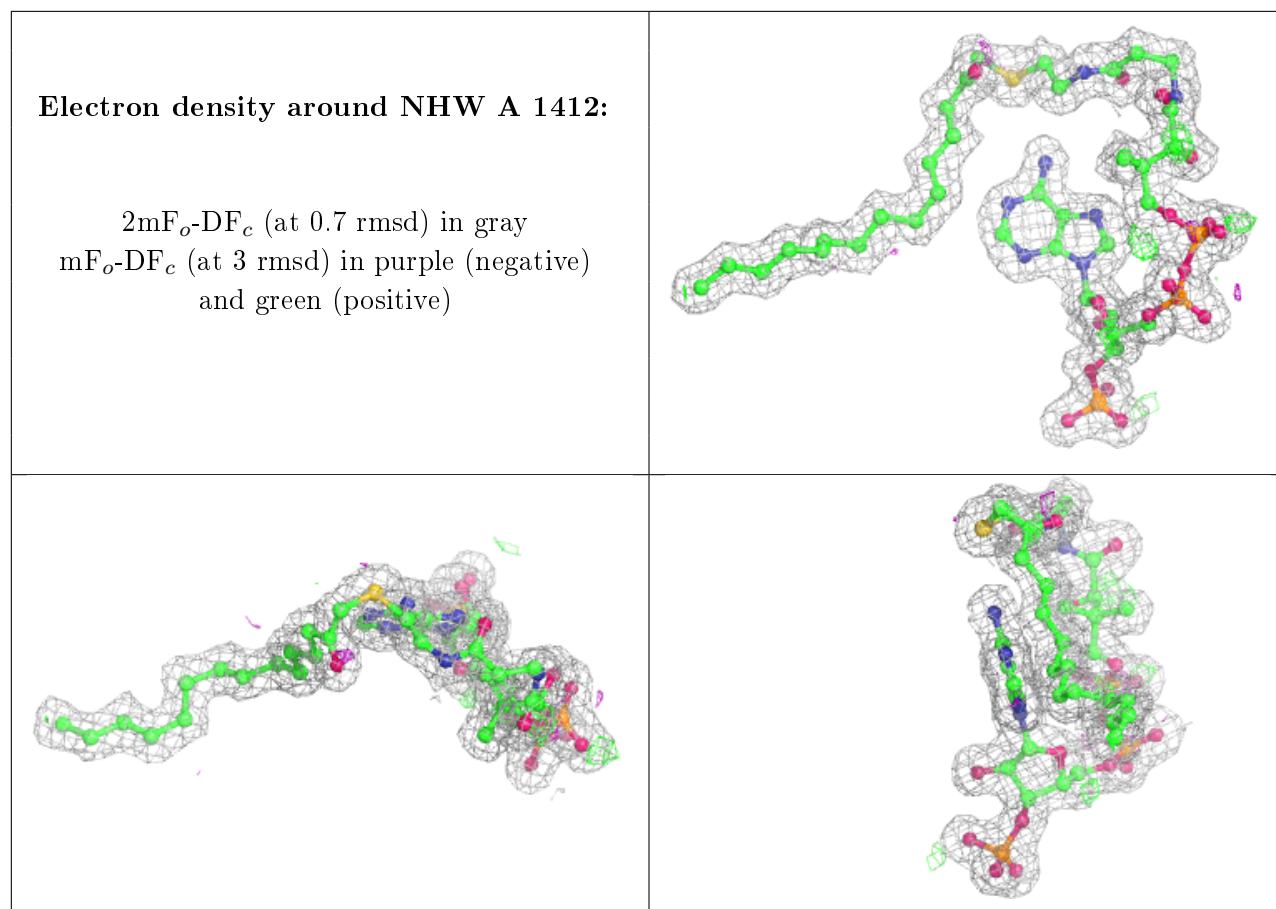


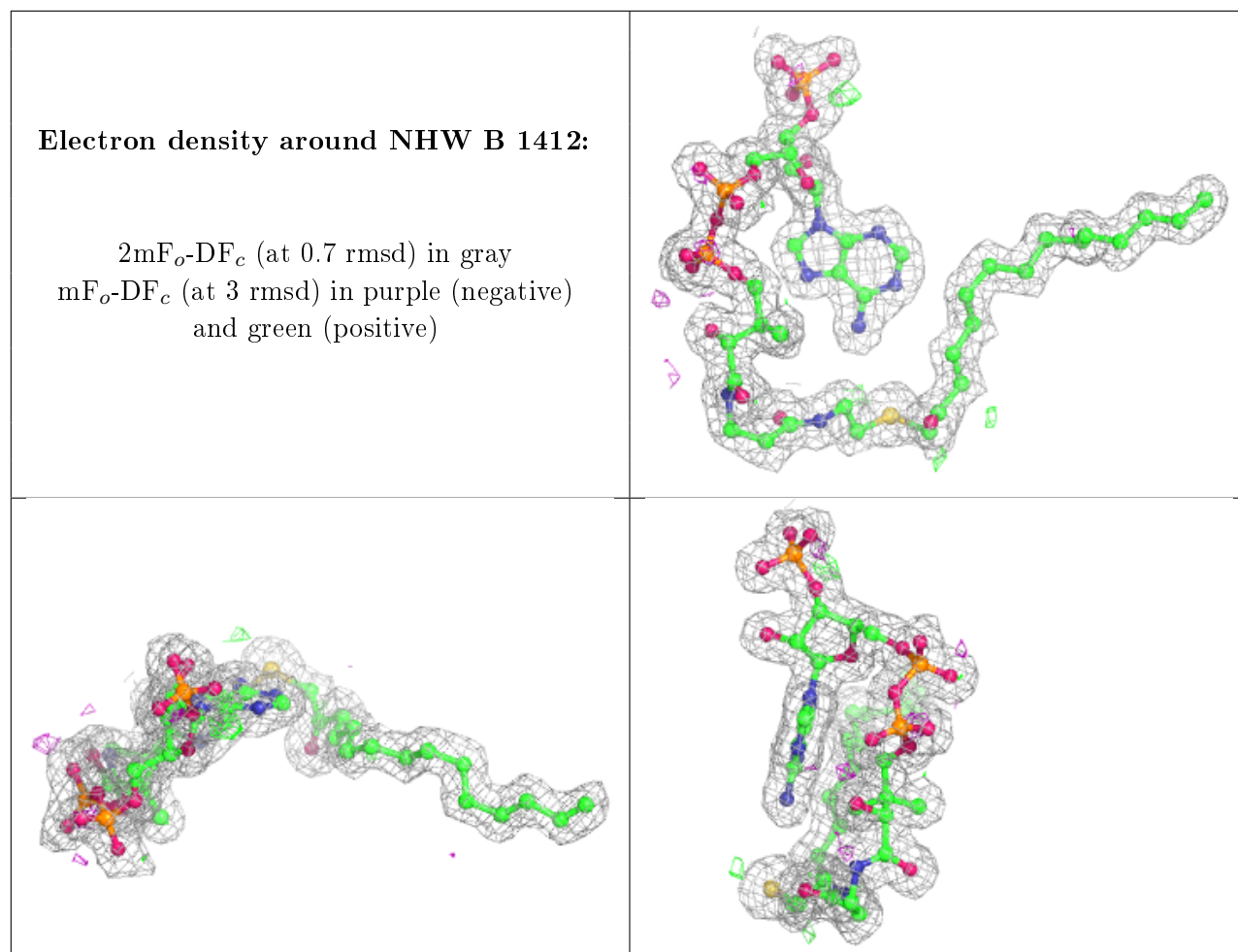


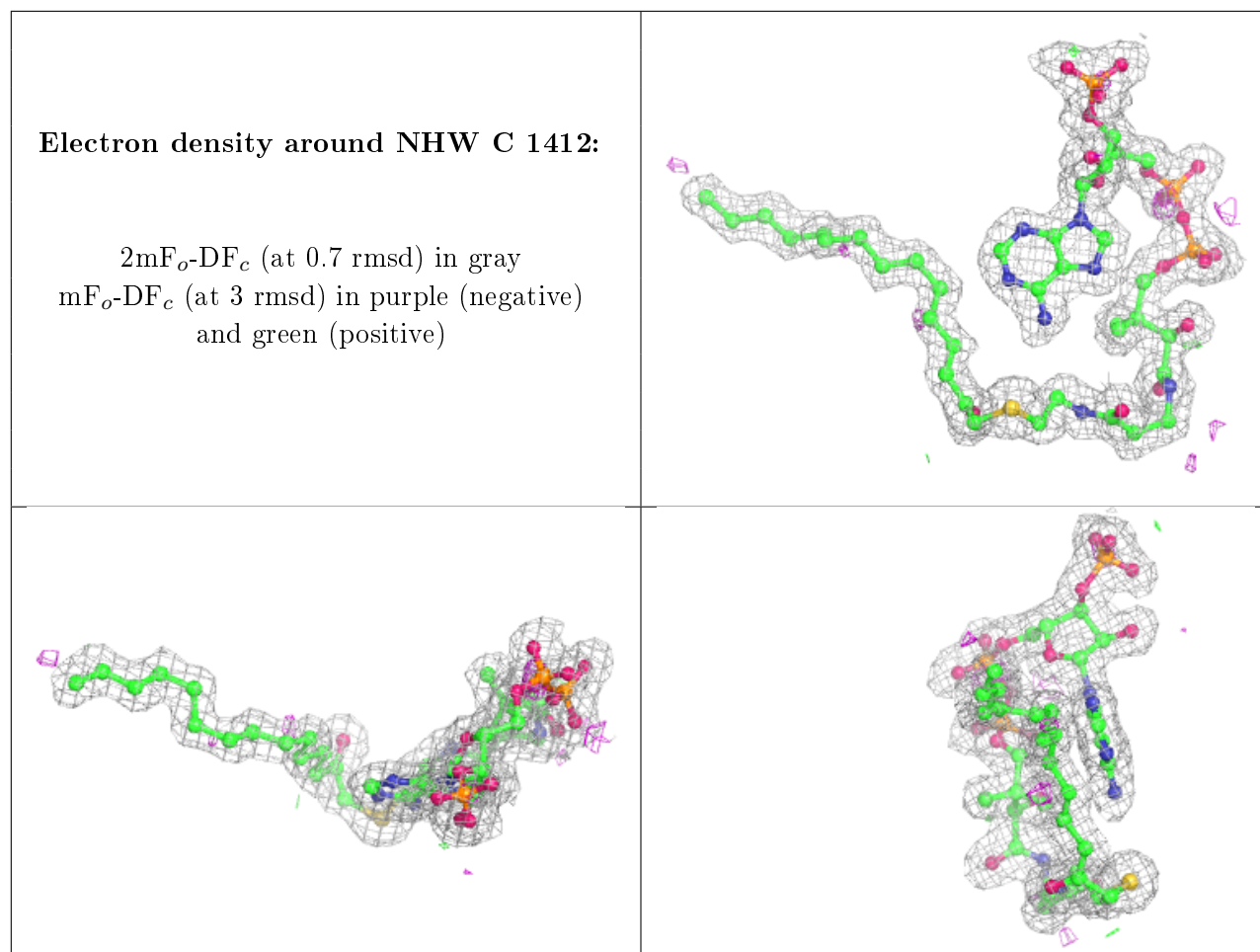
**Electron density around C23 A 1411:**

$2mF_o-DF_c$  (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.