



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 7, 2023 – 06:45 PM JST

PDB ID : 8IC7  
Title : exo-beta-D-arabinofuranosidase ExoMA2 from *Microbacterium arabinogalactanolyticum* in complex with beta-D-arabinofuranose  
Authors : Fukushima, R.; Kashima, T.; Ishiwata, A.; Fujita, K.; Fushinobu, S.  
Deposited on : 2023-02-11  
Resolution : 1.35 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 : 2.35  
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) : 2.35

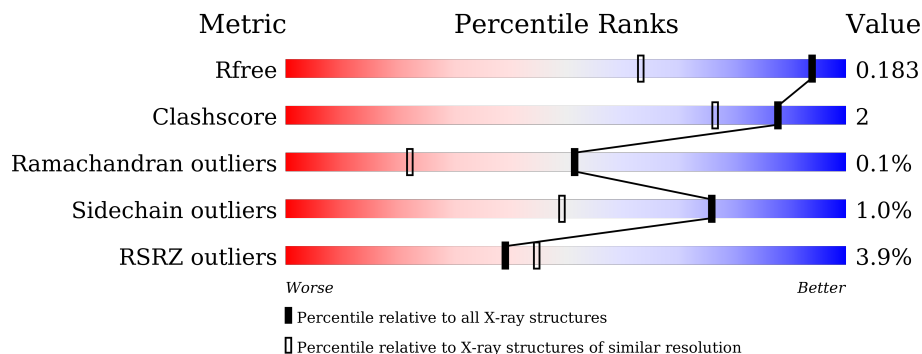
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.35 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	1509 (1.38-1.34)
Clashscore	141614	1551 (1.38-1.34)
Ramachandran outliers	138981	1530 (1.38-1.34)
Sidechain outliers	138945	1530 (1.38-1.34)
RSRZ outliers	127900	1487 (1.38-1.34)

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	867	
1	B	867	

## 2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 14948 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 exo-beta-D-arabinofuranosidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	B	855	6618	4163	1198	1246	11	0	0	0
1	A	853	6616	4161	1199	1245	11	0	1	0

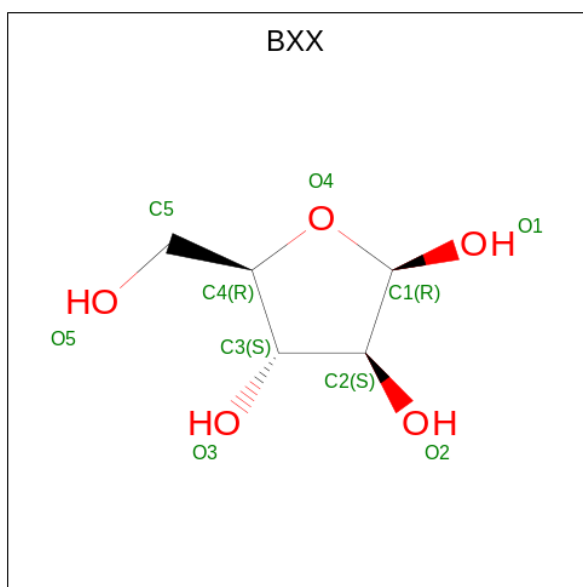
- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	8	Total	Mg	0	0
			8	8		
2	A	7	Total	Mg	0	0
			7	7		

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

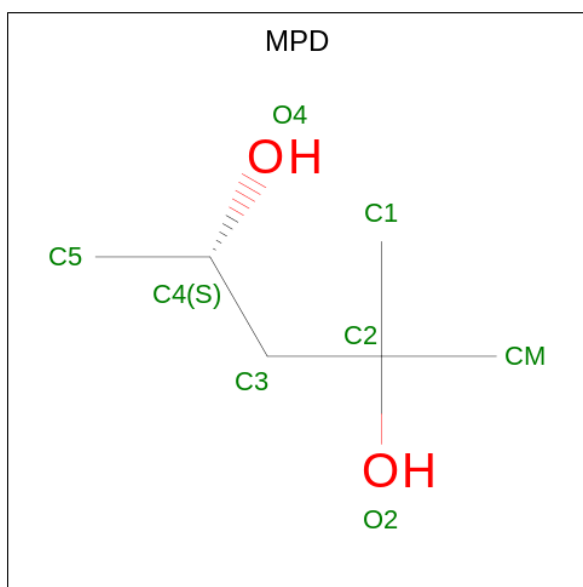
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	2	Total	Cl	0	0
			2	2		
3	A	1	Total	Cl	0	0
			1	1		

- Molecule 4 is beta-D-arabinofuranose (three-letter code: BXX) (formula: C<sub>5</sub>H<sub>10</sub>O<sub>5</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total C O 10 5 5	0	0
4	B	1	Total C O 10 5 5	0	0
4	B	1	Total C O 10 5 5	0	0
4	A	1	Total C O 10 5 5	0	0
4	A	1	Total C O 10 5 5	0	0

- Molecule 5 is (4S)-2-METHYL-2,4-PENTANEDIOL (three-letter code: MPD) (formula: C<sub>6</sub>H<sub>14</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total C O 8 6 2	0	0
5	A	1	Total C O 8 6 2	0	0

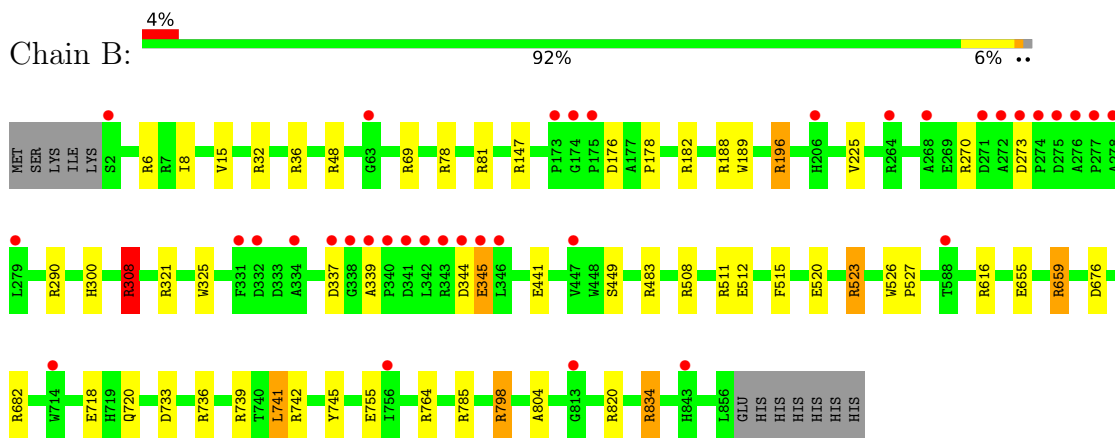
- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	B	803	Total O 803 803	0	0
6	A	827	Total O 827 827	0	0

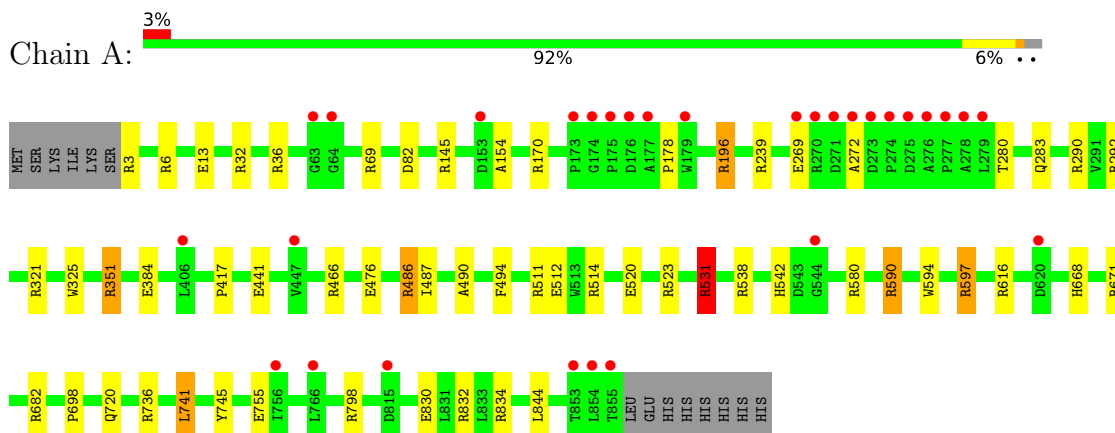
### 3 Residue-property plots

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: exo-beta-D-arabinofuranosidase



- Molecule 1: exo-beta-D-arabinofuranosidase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	66.76Å 97.25Å 139.68Å 90.00° 101.25° 90.00°	Depositor
Resolution (Å)	45.87 – 1.35 45.82 – 1.35	Depositor EDS
% Data completeness (in resolution range)	99.9 (45.87-1.35) 99.9 (45.82-1.35)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.66 (at 1.35Å)	Xtrriage
Refinement program	REFMAC 5.8.0403	Depositor
R, $R_{free}$	0.159 , 0.182 0.160 , 0.183	Depositor DCC
$R_{free}$ test set	19294 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	15.4	Xtrriage
Anisotropy	0.091	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.39 , 44.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.019 for h,-k,-h-l	Xtrriage
$F_o, F_c$ correlation	0.98	EDS
Total number of atoms	14948	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	20.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.17% 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: MPD, CL, MG, BXX

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	0.59	3/6801 (0.0%)	0.94	24/9273 (0.3%)
1	B	0.54	0/6800	0.90	14/9273 (0.2%)
All	All	0.57	3/13601 (0.0%)	0.92	38/18546 (0.2%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	9
1	B	0	9
All	All	0	18

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	384	GLU	CD-OE2	7.19	1.33	1.25
1	A	384	GLU	CD-OE1	7.00	1.33	1.25
1	A	13	GLU	CD-OE1	-6.10	1.19	1.25

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	32	ARG	NE-CZ-NH1	10.79	125.69	120.30
1	A	32	ARG	NE-CZ-NH2	-10.19	115.20	120.30
1	B	32	ARG	NE-CZ-NH2	-8.65	115.97	120.30
1	B	6	ARG	NE-CZ-NH2	-8.26	116.17	120.30
1	A	32	ARG	NE-CZ-NH1	7.96	124.28	120.30
1	A	145	ARG	NE-CZ-NH1	7.88	124.24	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	145	ARG	NE-CZ-NH2	-7.82	116.39	120.30
1	A	292	ARG	NE-CZ-NH1	7.59	124.10	120.30
1	A	514	ARG	NE-CZ-NH2	-7.18	116.71	120.30
1	A	351	ARG	NE-CZ-NH2	-6.80	116.90	120.30
1	A	514	ARG	NE-CZ-NH1	6.70	123.65	120.30
1	A	292	ARG	NE-CZ-NH2	-6.67	116.97	120.30
1	B	742	ARG	NE-CZ-NH2	-6.51	117.04	120.30
1	A	671	ARG	NE-CZ-NH1	-6.50	117.05	120.30
1	B	511	ARG	NE-CZ-NH2	-6.27	117.17	120.30
1	B	48	ARG	NE-CZ-NH2	-6.04	117.28	120.30
1	B	81	ARG	NE-CZ-NH2	-5.91	117.34	120.30
1	B	739	ARG	NE-CZ-NH2	-5.85	117.38	120.30
1	A	736	ARG	NE-CZ-NH2	-5.76	117.42	120.30
1	B	78	ARG	NE-CZ-NH2	-5.66	117.47	120.30
1	B	682	ARG	NE-CZ-NH2	-5.63	117.48	120.30
1	A	538	ARG	NE-CZ-NH2	-5.61	117.49	120.30
1	A	6	ARG	NE-CZ-NH2	-5.52	117.54	120.30
1	A	844	LEU	CB-CA-C	-5.51	99.73	110.20
1	A	597	ARG	NE-CZ-NH2	-5.51	117.55	120.30
1	A	170	ARG	NE-CZ-NH2	-5.50	117.55	120.30
1	A	466	ARG	NE-CZ-NH1	-5.47	117.57	120.30
1	A	351	ARG	NE-CZ-NH1	5.43	123.02	120.30
1	B	483	ARG	NE-CZ-NH2	-5.41	117.59	120.30
1	A	531	ARG	NE-CZ-NH1	5.38	122.99	120.30
1	A	239	ARG	NE-CZ-NH1	5.34	122.97	120.30
1	B	834	ARG	NE-CZ-NH2	-5.28	117.66	120.30
1	A	798	ARG	NE-CZ-NH2	-5.27	117.66	120.30
1	A	531	ARG	NE-CZ-NH2	-5.21	117.69	120.30
1	B	308	ARG	NE-CZ-NH2	-5.13	117.73	120.30
1	A	511	ARG	NE-CZ-NH1	-5.07	117.76	120.30
1	B	764	ARG	NE-CZ-NH2	-5.03	117.78	120.30
1	A	239	ARG	NE-CZ-NH2	-5.01	117.80	120.30

There are no chirality outliers.

All (18) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	196	ARG	Sidechain
1	A	351	ARG	Sidechain
1	A	36	ARG	Sidechain
1	A	486	ARG	Sidechain
1	A	531	ARG	Sidechain

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Mol	Chain	Res	Type	Group
1	A	590	ARG	Sidechain
1	A	597	ARG	Sidechain
1	A	682	ARG	Sidechain
1	A	69	ARG	Sidechain
1	B	147	ARG	Sidechain
1	B	196	ARG	Sidechain
1	B	308	ARG	Sidechain
1	B	36	ARG	Sidechain
1	B	523	ARG	Sidechain
1	B	659	ARG	Sidechain
1	B	69	ARG	Sidechain
1	B	785	ARG	Sidechain
1	B	798	ARG	Sidechain

## 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	6616	0	6282	27	0
1	B	6618	0	6281	24	0
2	A	7	0	0	0	0
2	B	8	0	0	0	0
3	A	1	0	0	0	0
3	B	2	0	0	0	0
4	A	20	0	19	3	0
4	B	30	0	30	1	0
5	A	8	0	14	3	0
5	B	8	0	14	2	0
6	A	827	0	0	3	0
6	B	803	0	0	5	0
All	All	14948	0	12640	52	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 2.

All (52) 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:B:676:ASP:OD2	4:B:914:BXX:H5	1.52	1.09
1:A:280:THR:HG23	1:A:283:GLN:H	1.41	0.83
1:A:542:HIS:HE1	6:A:1165:HOH:O	1.65	0.77
1:B:733:ASP:OD1	1:B:736:ARG:NH2	2.22	0.71
1:A:834:ARG:NH2	6:A:1001:HOH:O	2.26	0.69
1:A:531:ARG:HH11	1:A:531:ARG:HG3	1.58	0.67
1:A:280:THR:HG22	1:A:283:GLN:CG	2.28	0.64
1:B:520:GLU:OE2	1:B:523:ARG:NH1	2.30	0.64
1:A:280:THR:HG22	1:A:283:GLN:HG3	1.80	0.64
1:A:520:GLU:OE2	1:A:523:ARG:NH1	2.32	0.63
1:A:321:ARG:NH1	5:A:910:MPD:H4	2.13	0.63
1:A:830:GLU:OE2	1:A:832:ARG:NH1	2.28	0.62
1:B:321:ARG:NH1	5:B:913:MPD:H4	2.16	0.61
1:B:339:ALA:HB3	6:B:1608:HOH:O	2.06	0.55
1:B:718:GLU:HB3	1:B:741:LEU:HD12	1.90	0.53
1:A:280:THR:CG2	1:A:283:GLN:HG3	2.39	0.53
1:B:321:ARG:HH11	5:B:913:MPD:H4	1.74	0.52
1:A:154:ALA:HB3	6:A:1366:HOH:O	2.10	0.51
1:A:486:ARG:HD2	1:A:490:ALA:O	2.10	0.50
1:B:344:ASP:O	1:B:345:GLU:HB2	2.12	0.49
1:A:269:GLU:HB2	1:A:272:ALA:HB2	1.94	0.49
1:B:300:HIS:CD2	1:B:308:ARG:HD3	2.48	0.48
1:A:325:TRP:CD2	1:A:441:GLU:HB2	2.49	0.48
1:B:189:TRP:CZ3	1:B:225:VAL:HG11	2.49	0.47
1:B:745:TYR:CE1	1:B:755:GLU:HA	2.50	0.47
1:B:655:GLU:OE1	1:B:659:ARG:NH2	2.47	0.47
1:A:280:THR:CG2	1:A:283:GLN:H	2.21	0.47
1:B:270:ARG:HA	1:A:494:PHE:CE2	2.50	0.47
1:B:176:ASP:O	1:B:182:ARG:HA	2.15	0.46
1:A:745:TYR:CE1	1:A:755:GLU:HA	2.50	0.46
1:B:515:PHE:O	1:B:804:ALA:HB2	2.15	0.46
1:B:798:ARG:HD2	1:B:820:ARG:HH22	1.80	0.46
1:B:834:ARG:NH2	6:B:1027:HOH:O	2.50	0.45
1:A:476:GLU:H	1:A:476:GLU:CD	2.20	0.45
1:B:325:TRP:CD2	1:B:441:GLU:HB2	2.52	0.45
1:B:188:ARG:NE	6:B:1029:HOH:O	2.50	0.44
1:A:741:LEU:C	1:A:741:LEU:HD12	2.38	0.43
1:A:321:ARG:HH11	5:A:910:MPD:H4	1.81	0.43
6:B:1574:HOH:O	4:A:911:BXX:H5	2.19	0.43
1:A:325:TRP:HA	5:A:910:MPD:H53	2.00	0.43
1:A:3:ARG:HH11	1:A:3:ARG:HD3	1.70	0.42
1:A:590:ARG:HD3	1:A:594:TRP:CZ2	2.55	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:82:ASP:OD2	4:A:911:BXX:C5	2.68	0.42
1:B:526:TRP:HB3	1:B:527:PRO:HD3	2.02	0.42
1:A:668:HIS:CG	1:A:698:PRO:HG3	2.55	0.42
1:A:417:PRO:HB2	1:A:487:ILE:O	2.20	0.41
1:A:178:PRO:HG2	1:A:290:ARG:CZ	2.50	0.41
1:B:8:ILE:HG21	1:B:15:VAL:HG21	2.03	0.41
1:B:300:HIS:CD2	1:B:308:ARG:CD	3.04	0.41
6:B:1574:HOH:O	4:A:911:BXX:C5	2.69	0.41
1:B:449:SER:HA	1:B:508:ARG:HD3	2.02	0.40
1:B:178:PRO:HG2	1:B:290:ARG:CZ	2.52	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	852/867 (98%)	830 (97%)	22 (3%)	0	100	100
1	B	853/867 (98%)	832 (98%)	20 (2%)	1 (0%)	51	22
All	All	1705/1734 (98%)	1662 (98%)	42 (2%)	1 (0%)	51	22

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	345	GLU

### 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	660/673 (98%)	654 (99%)	6 (1%)	78	53
1	B	660/673 (98%)	653 (99%)	7 (1%)	73	45
All	All	1320/1346 (98%)	1307 (99%)	13 (1%)	76	49

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	196	ARG
1	B	273	ASP
1	B	337	ASP
1	B	512	GLU
1	B	616	ARG
1	B	720	GLN
1	B	741	LEU
1	A	196	ARG
1	A	512	GLU
1	A	580	ARG
1	A	616	ARG
1	A	720	GLN
1	A	741	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	542	HIS
1	A	592	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 25 ligands modelled in this entry, 18 are monoatomic - leaving 7 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	BXX	A	911	-	10,10,10	1.02	1 (10%)	13,14,14	1.65	4 (30%)
4	BXX	A	909	-	10,10,10	0.68	0	13,14,14	0.75	0
4	BXX	B	911	-	10,10,10	0.70	0	13,14,14	1.45	3 (23%)
5	MPD	A	910	-	7,7,7	0.45	0	9,10,10	1.02	1 (11%)
4	BXX	B	914	-	10,10,10	3.58	2 (20%)	13,14,14	1.97	5 (38%)
4	BXX	B	912	-	10,10,10	0.69	0	13,14,14	0.77	0
5	MPD	B	913	-	7,7,7	0.19	0	9,10,10	0.95	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	BXX	A	911	-	-	2/2/18/18	0/1/1/1
4	BXX	A	909	-	-	0/2/18/18	0/1/1/1
4	BXX	B	911	-	-	2/2/18/18	0/1/1/1
5	MPD	A	910	-	-	3/5/5/5	-
4	BXX	B	914	-	-	2/2/18/18	0/1/1/1
4	BXX	B	912	-	-	0/2/18/18	0/1/1/1
5	MPD	B	913	-	-	3/5/5/5	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	914	BXX	O4-C1	10.93	1.56	1.43
4	B	914	BXX	C1-C2	2.55	1.55	1.52
4	A	911	BXX	O4-C1	2.53	1.46	1.43

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	914	BXX	O2-C2-C1	4.11	123.15	111.82
4	B	914	BXX	O2-C2-C3	-2.76	102.88	111.82
4	B	911	BXX	O3-C3-C2	2.69	120.52	111.82
5	A	910	MPD	O4-C4-C3	2.58	121.78	111.36
4	B	911	BXX	C2-C3-C4	-2.49	97.80	102.64
4	B	914	BXX	O4-C4-C5	2.30	114.18	109.21
4	B	914	BXX	C1-C2-C3	-2.25	99.48	102.30
4	A	911	BXX	O3-C3-C4	2.23	117.51	111.05
4	B	914	BXX	O3-C3-C4	2.17	117.33	111.05
4	A	911	BXX	O2-C2-C1	2.16	117.78	111.82
4	A	911	BXX	C2-C3-C4	-2.14	98.49	102.64
4	B	911	BXX	O5-C5-C4	-2.10	104.09	111.29
4	A	911	BXX	C1-C2-C3	-2.01	99.79	102.30

There are no chirality outliers.

All (12) torsion outliers are listed below:

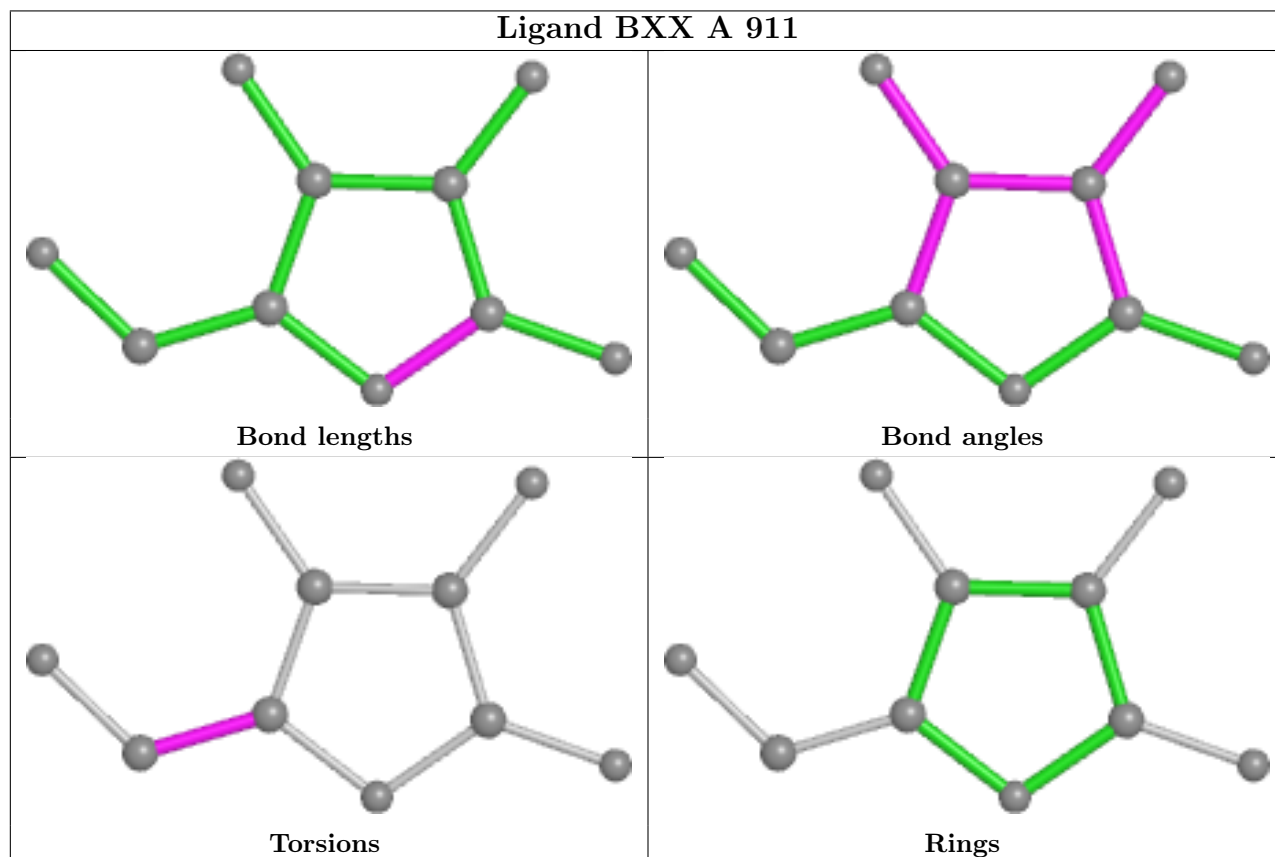
Mol	Chain	Res	Type	Atoms
4	B	914	BXX	C3-C4-C5-O5
5	B	913	MPD	C2-C3-C4-O4
4	B	914	BXX	O4-C4-C5-O5
4	B	911	BXX	O4-C4-C5-O5
4	A	911	BXX	O4-C4-C5-O5
4	B	911	BXX	C3-C4-C5-O5
4	A	911	BXX	C3-C4-C5-O5
5	A	910	MPD	C2-C3-C4-O4
5	A	910	MPD	CM-C2-C3-C4
5	B	913	MPD	O2-C2-C3-C4
5	A	910	MPD	O2-C2-C3-C4
5	B	913	MPD	C2-C3-C4-C5

There are no ring outliers.

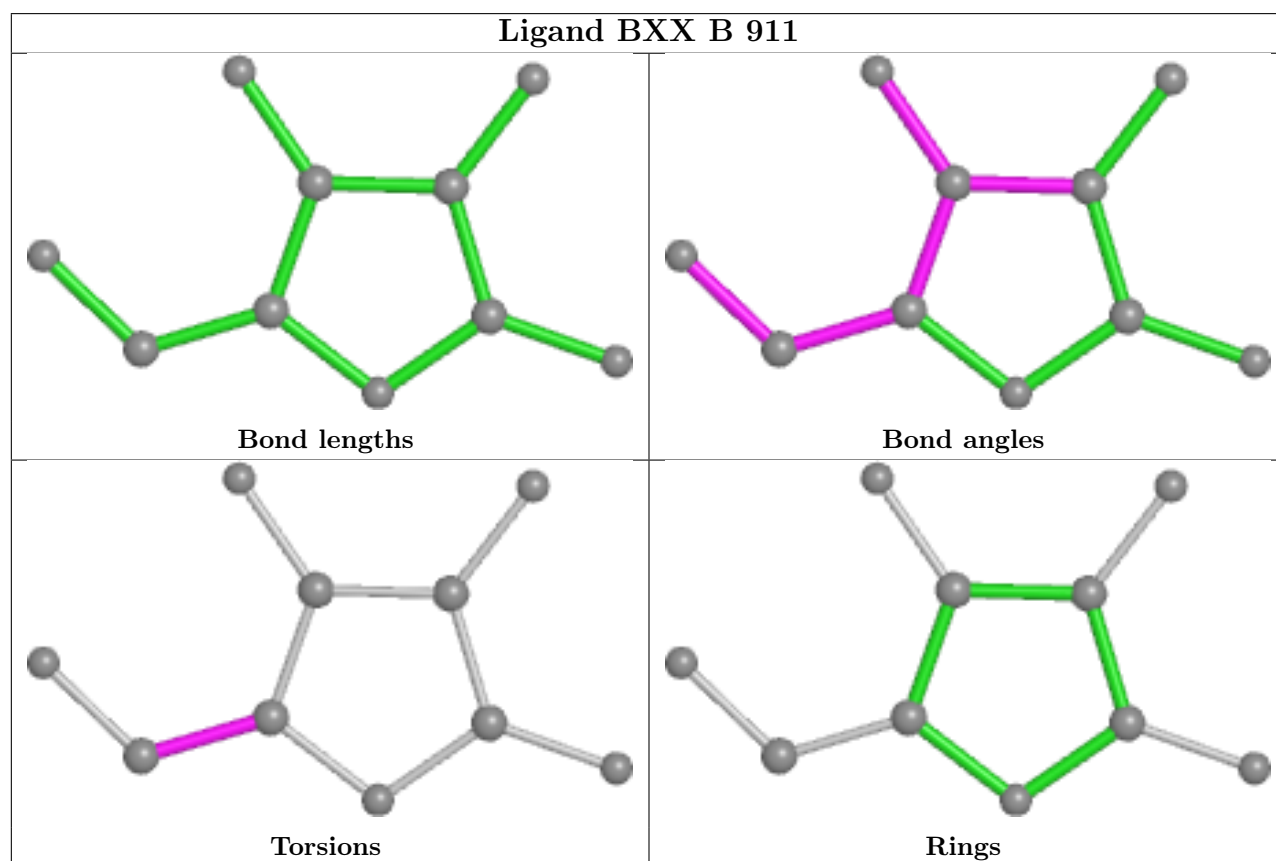
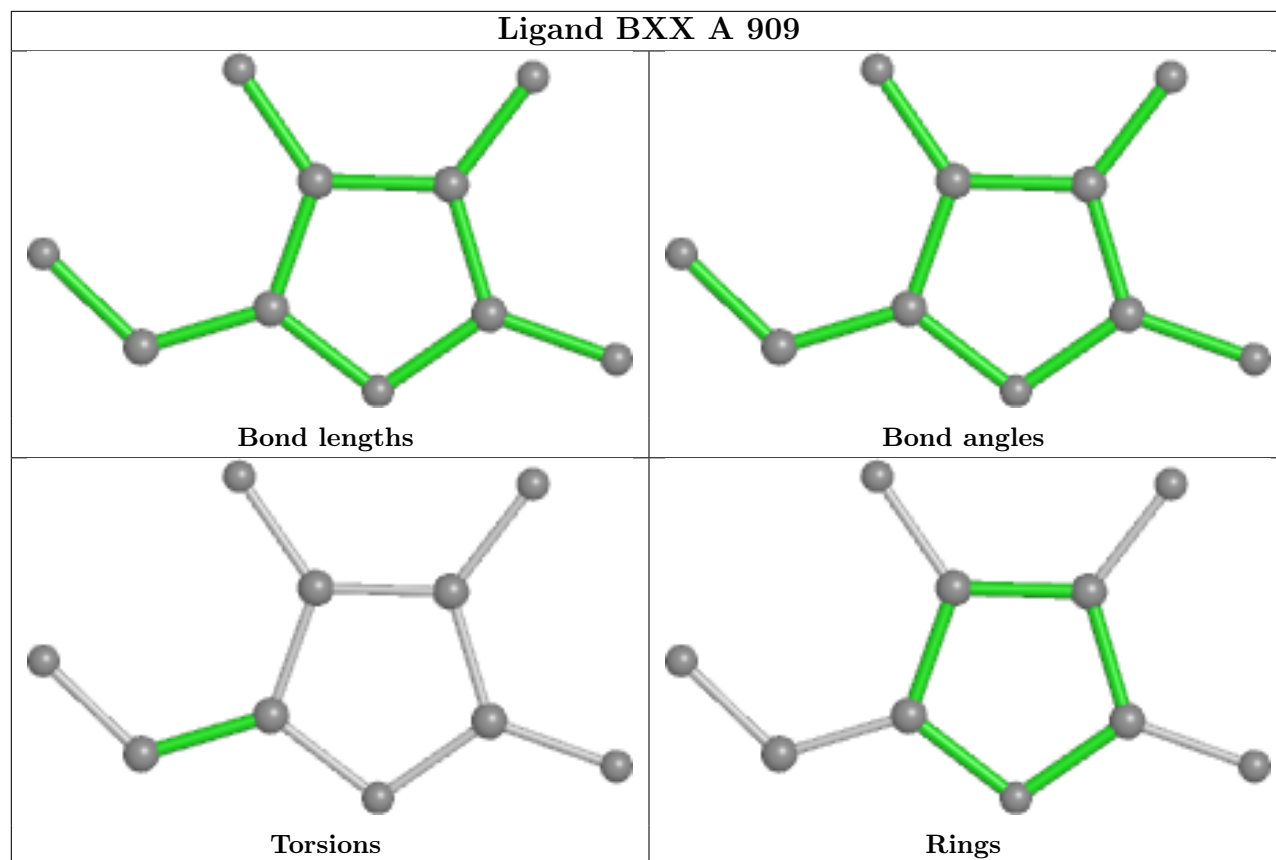
4 monomers are involved in 9 short contacts:

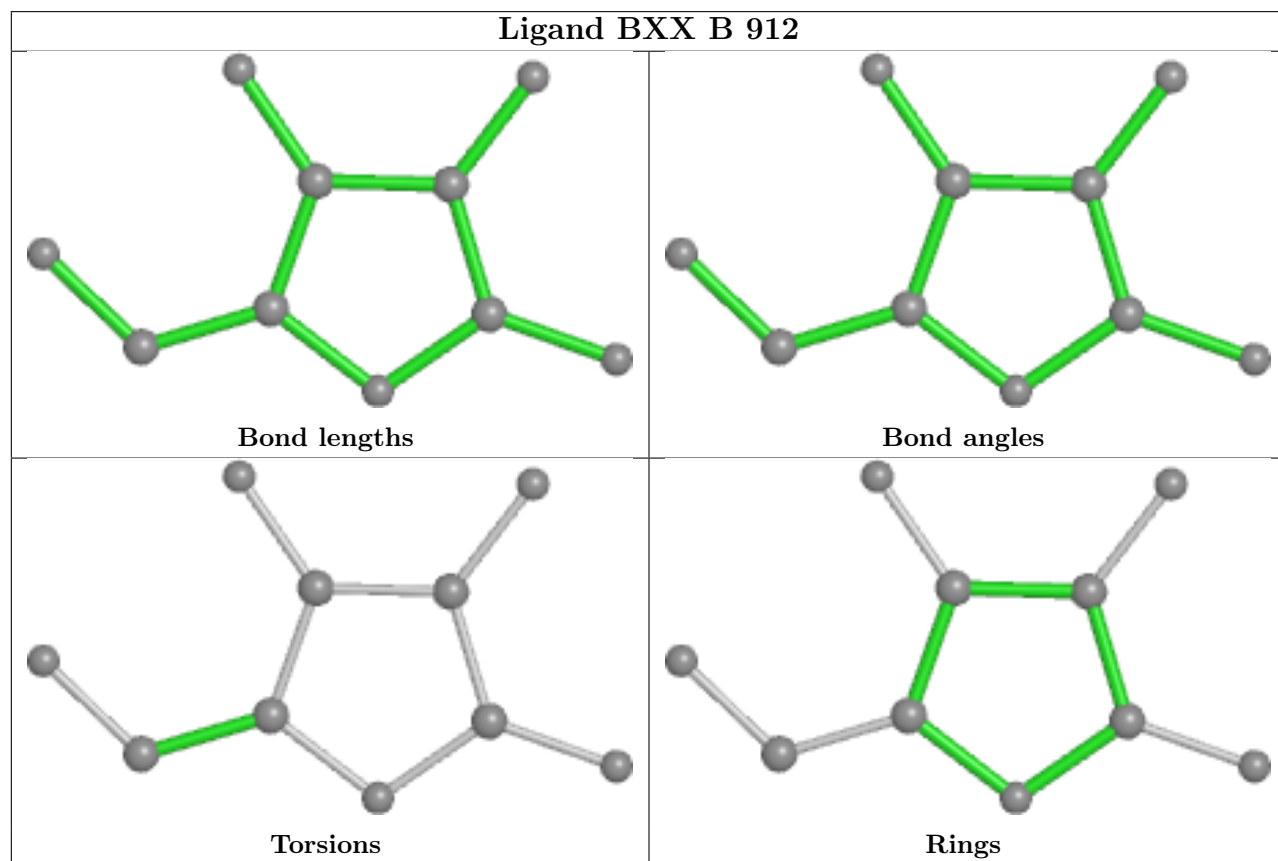
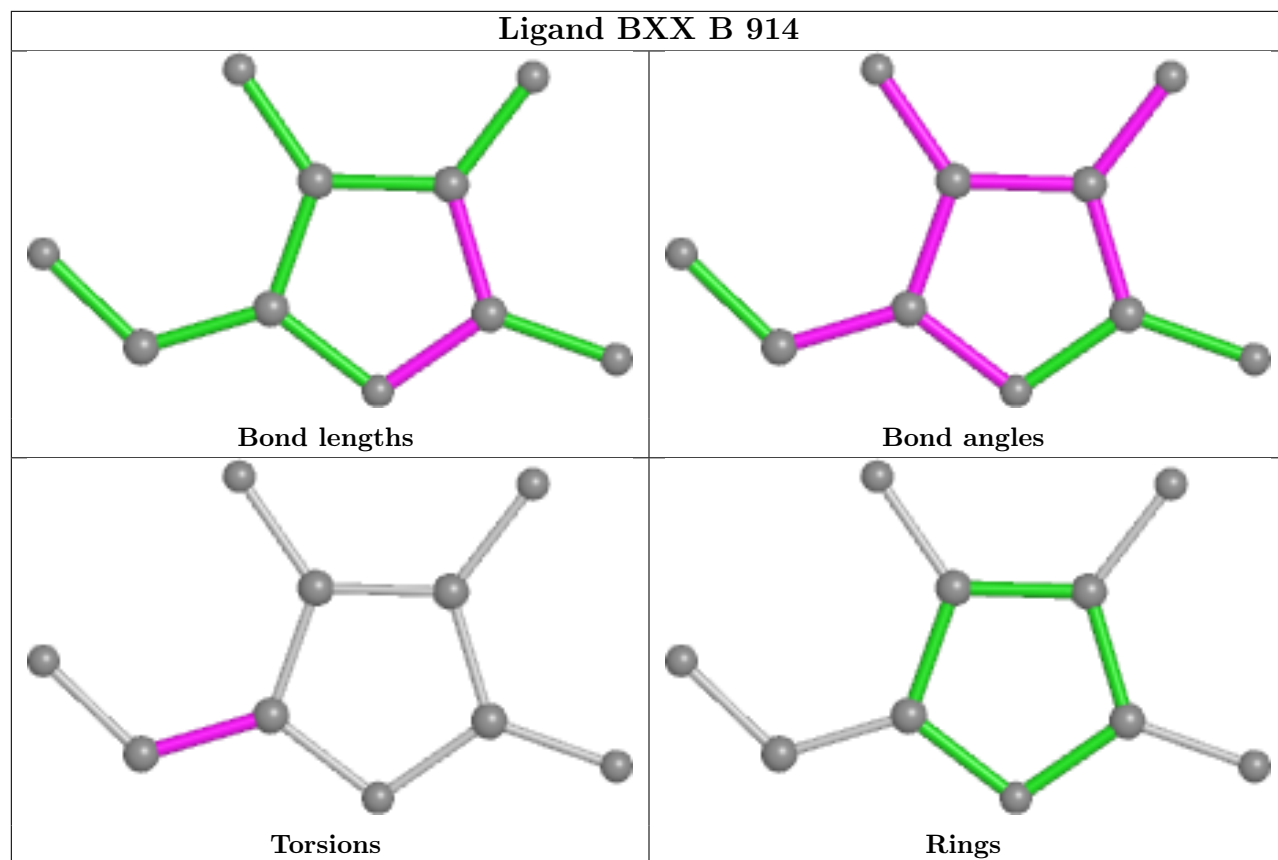
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	911	BXX	3	0
5	A	910	MPD	3	0
4	B	914	BXX	1	0
5	B	913	MPD	2	0

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	853/867 (98%)	-0.06	30 (3%) 44 49	11, 16, 32, 76	0
1	B	855/867 (98%)	0.00	36 (4%) 36 41	11, 18, 35, 78	0
All	All	1708/1734 (98%)	-0.03	66 (3%) 39 45	11, 17, 33, 78	0

All (66) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	339	ALA	6.5
1	A	275	ASP	6.3
1	A	274	PRO	5.9
1	B	338	GLY	5.7
1	B	271	ASP	5.7
1	B	276	ALA	5.7
1	A	278	ALA	5.6
1	A	855	THR	5.5
1	A	176	ASP	5.2
1	B	340	PRO	5.2
1	A	175	PRO	5.1
1	B	337	ASP	5.0
1	B	344	ASP	5.0
1	B	275	ASP	4.7
1	B	345	GLU	4.6
1	A	277	PRO	4.5
1	A	173	PRO	4.4
1	A	276	ALA	4.3
1	A	273	ASP	4.0
1	A	272	ALA	3.8
1	A	174	GLY	3.6
1	B	272	ALA	3.5
1	B	342	LEU	3.5
1	B	2	SER	3.5

*Continued on next page...*

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	B	346	LEU	3.4
1	B	173	PRO	3.3
1	B	175	PRO	3.1
1	A	271	ASP	3.1
1	B	277	PRO	3.1
1	B	273	ASP	3.0
1	B	63	GLY	3.0
1	A	279	LEU	3.0
1	B	264	ARG	2.9
1	B	588	THR	2.9
1	B	813	GLY	2.9
1	A	544	GLY	2.8
1	B	274	PRO	2.7
1	B	756	ILE	2.7
1	A	153	ASP	2.7
1	B	343	ARG	2.7
1	A	179	TRP	2.7
1	B	331	PHE	2.6
1	A	63	GLY	2.5
1	B	278	ALA	2.5
1	B	334	ALA	2.5
1	B	206	HIS	2.5
1	A	815	ASP	2.5
1	B	174	GLY	2.4
1	A	853	THR	2.4
1	A	756	ILE	2.4
1	B	447	VAL	2.4
1	A	177	ALA	2.2
1	A	854	LEU	2.2
1	A	620	ASP	2.2
1	A	270	ARG	2.2
1	B	279	LEU	2.2
1	B	341	ASP	2.2
1	A	766	LEU	2.1
1	B	332	ASP	2.1
1	B	714	TRP	2.1
1	A	64	GLY	2.1
1	A	406	LEU	2.1
1	B	843	HIS	2.0
1	A	447	VAL	2.0
1	B	268	ALA	2.0
1	A	269	GLU	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 monosaccharides in this entry.

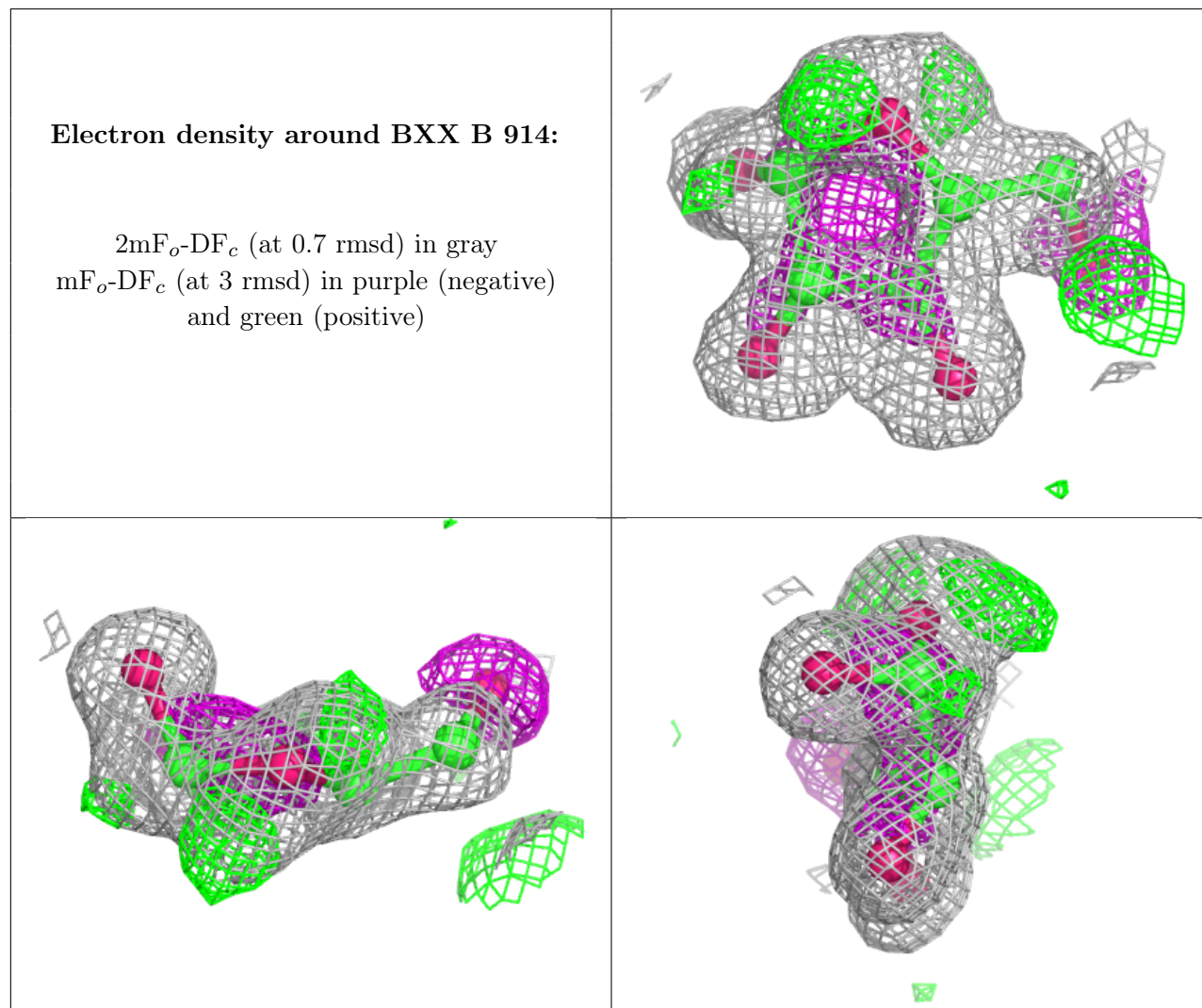
## 6.4 Ligands [i](#)

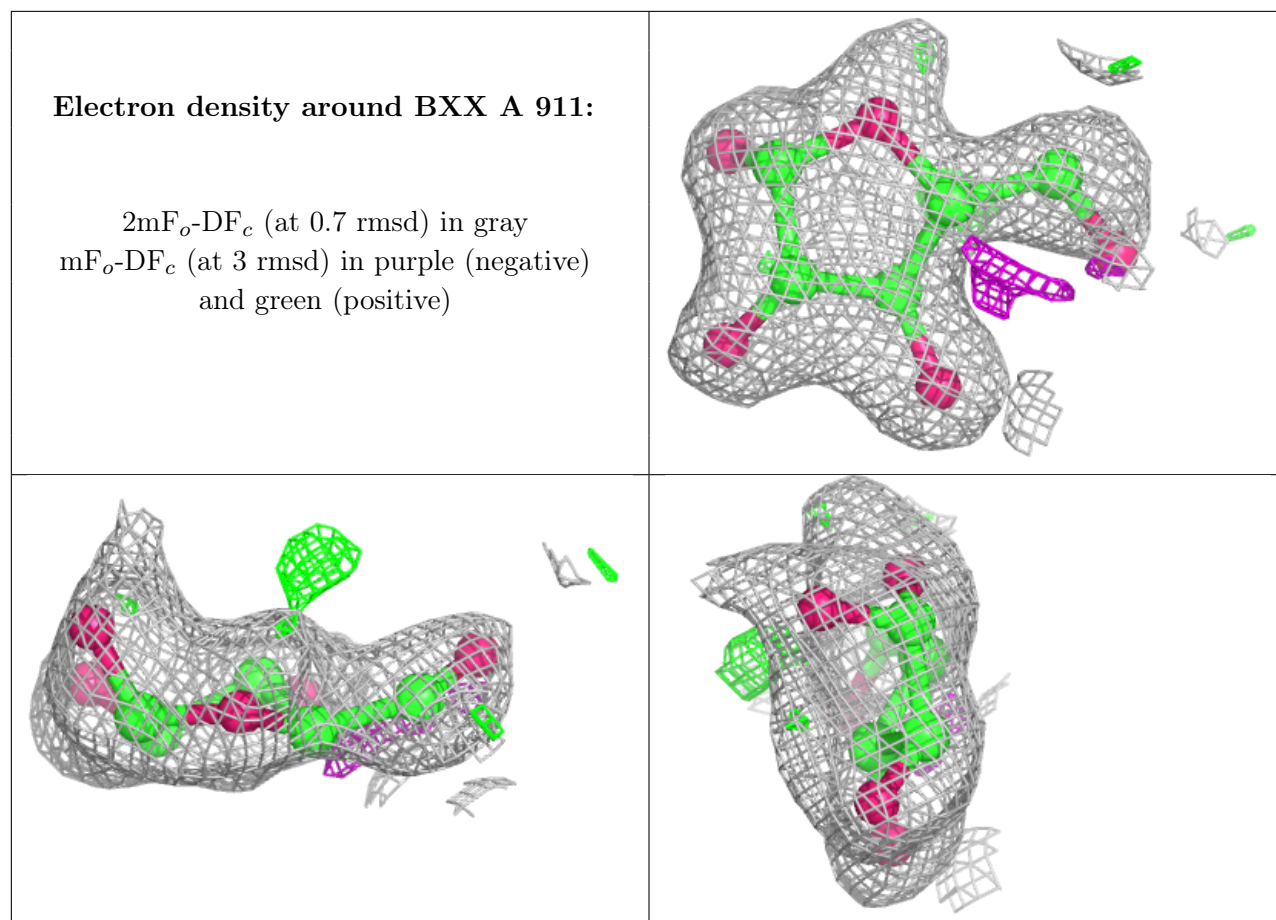
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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	BXX	B	914	10/10	0.80	0.22	25,29,30,43	0
5	MPD	A	910	8/8	0.83	0.12	26,28,31,33	0
5	MPD	B	913	8/8	0.84	0.14	23,25,27,30	0
4	BXX	A	911	10/10	0.86	0.13	27,42,47,50	0
4	BXX	B	911	10/10	0.88	0.17	26,45,56,68	0
2	MG	B	908	1/1	0.96	0.26	33,33,33,33	0
2	MG	B	902	1/1	0.96	0.18	41,41,41,41	0
2	MG	B	907	1/1	0.97	0.04	21,21,21,21	0
2	MG	B	903	1/1	0.97	0.05	21,21,21,21	0
2	MG	A	907	1/1	0.97	0.12	25,25,25,25	0
2	MG	B	905	1/1	0.97	0.11	28,28,28,28	0
4	BXX	A	909	10/10	0.98	0.09	12,13,13,14	0
2	MG	A	906	1/1	0.98	0.05	22,22,22,22	0
4	BXX	B	912	10/10	0.98	0.09	12,13,14,14	0
3	CL	B	909	1/1	0.98	0.03	42,42,42,42	0
3	CL	B	910	1/1	0.99	0.06	24,24,24,24	0
3	CL	A	908	1/1	0.99	0.11	24,24,24,24	0
2	MG	A	902	1/1	0.99	0.14	22,22,22,22	0
2	MG	A	903	1/1	0.99	0.04	15,15,15,15	0
2	MG	A	904	1/1	0.99	0.07	19,19,19,19	0
2	MG	A	905	1/1	0.99	0.04	19,19,19,19	0
2	MG	B	901	1/1	0.99	0.11	21,21,21,21	0
2	MG	B	906	1/1	0.99	0.04	18,18,18,18	0
2	MG	A	901	1/1	0.99	0.11	20,20,20,20	0
2	MG	B	904	1/1	1.00	0.03	16,16,16,16	0

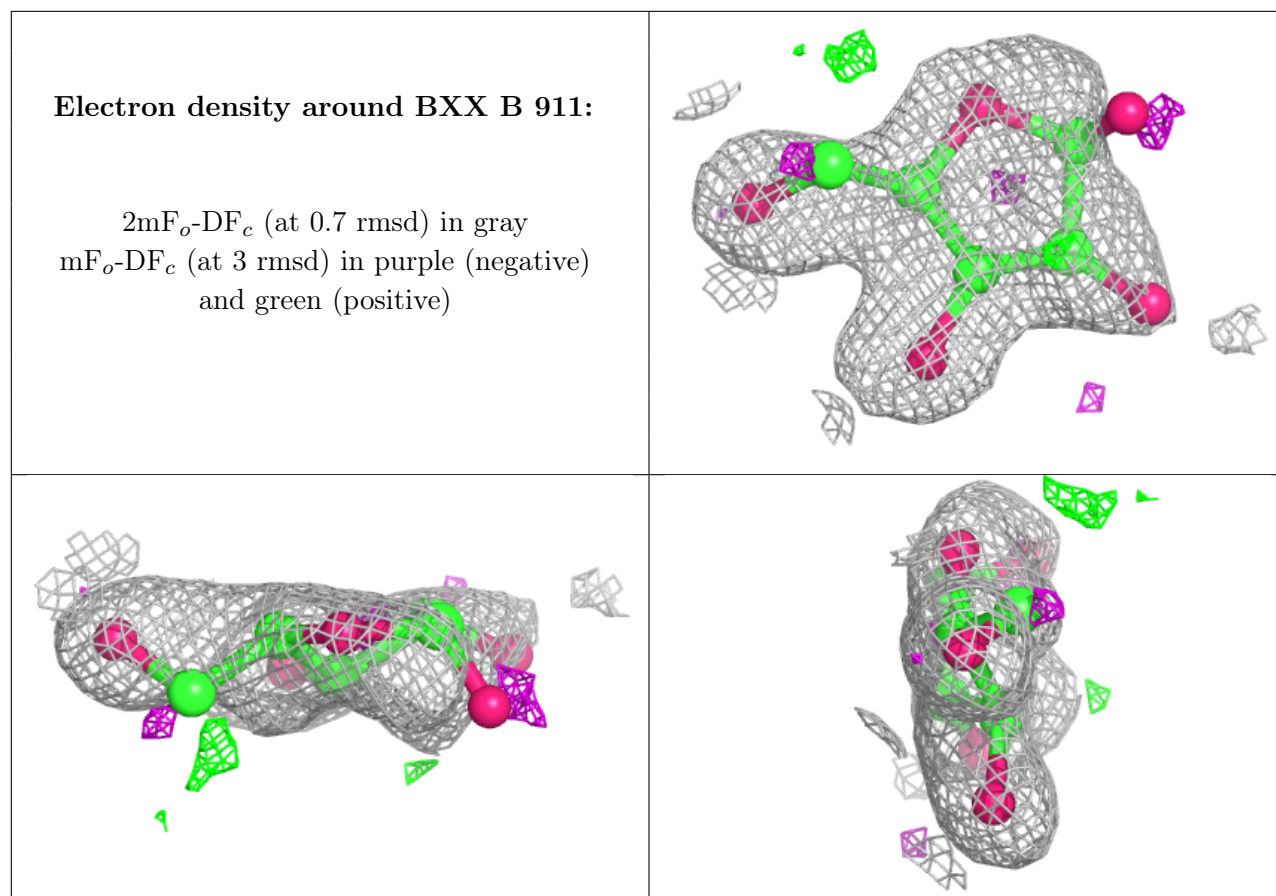
The following is a graphical depiction of the model fit to experimental electron density of all

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.



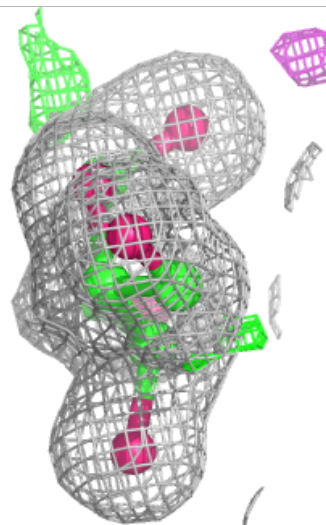
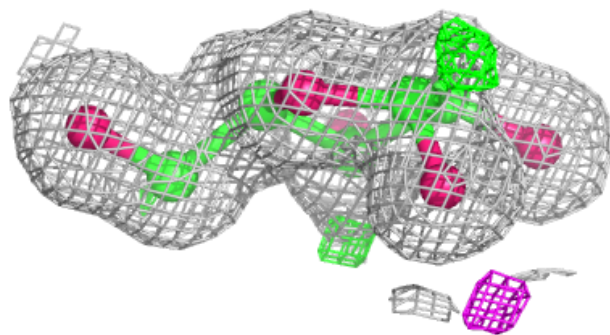
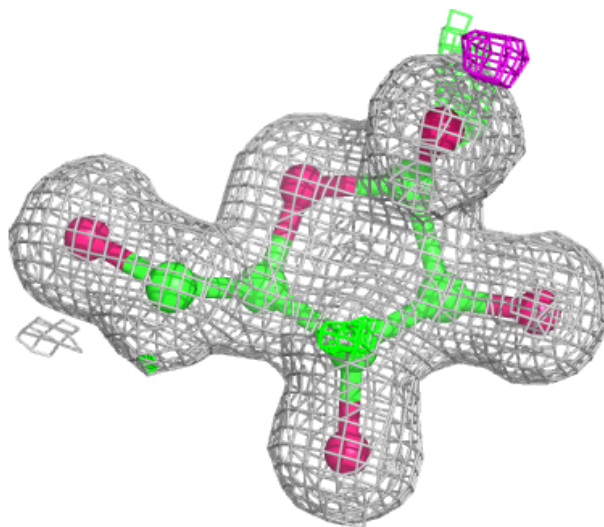


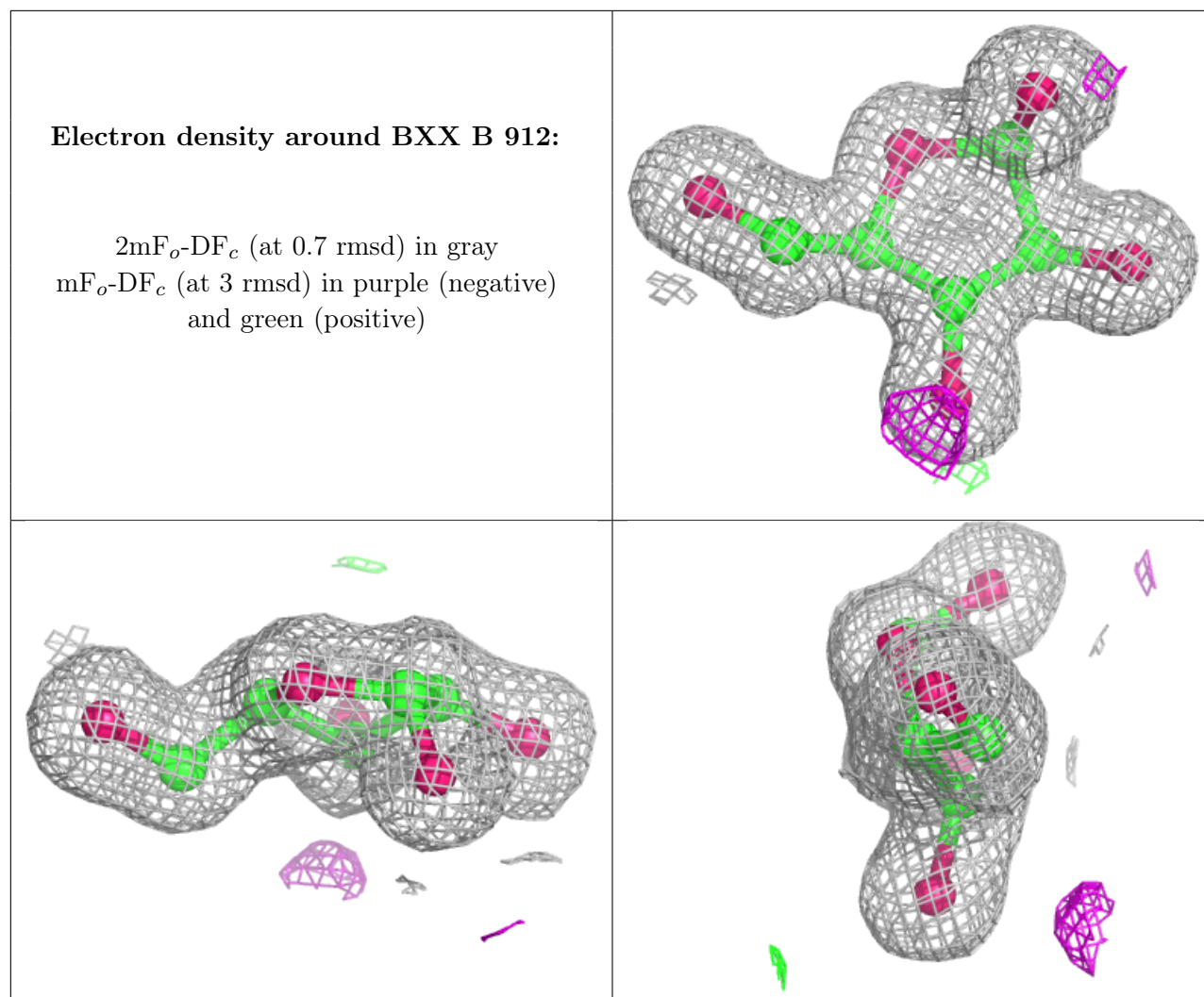




**Electron density around BXX A 909:**

$2mF_o-DF_c$  (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.